AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

JULY 1, 1960

Features • • •

INSIDE STORY OF CADILLAC QUALITY

TRENDS IN SPECIAL PURPOSE MACHINES

ARMORED VEHICLES IN AMERICA'S FUTURE

REPORT ON SAE SUMMER MEETING

QUARTERLY SURVEY OF MACHINE TOOLS

Army's Newest ▶

Front View of F255 Free Air Suspension Vehicle

ENGINEERING
MANAGEMENT • • PRODUCTION
DESIGN

Chicago Gear Mfg. Company tames tough steels, cuts costs with STANICUT Oil 208 BCS

Tames tough steels. Gears from one to 300 inches in diameter are machined by Chicago Gear. Steels up to 375 Brinell hardness are worked. STANICUT Oil 208 BCS helps them do it. STANICUT 208 contains maximum amounts of sulfur, chlorine and compounding for handling tough alloy steels. It is viscous enough to stay on tools and work, yet fluid enough for good cooling.

Cuts costs. STANICUT Oil 208 BCS is used at Chicago Gear for all gear hobbing operations and applications requiring a straight cutting fluid. There's no chance of the wrong fluid being used, thus no costly losses. One fluid cuts down inventory, saves time in keeping track of stocks, cuts paper work and ordering.

Gets service. Standard Oil's Dick Erickson is assigned to the Chicago Gear account. With a mechanical engineering degree from Purdue, plus several years' lubrication experience, Dick knows how to help a customer, knows how to supply technical help where it counts. Could STANICUT Oil 208 BCS and Standard Oil technical service help you? Ask about them at the Standard Oil office near you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

STANDARD

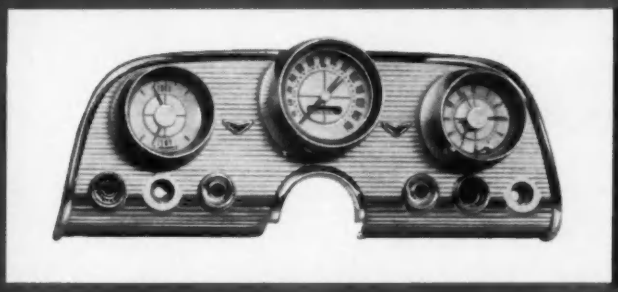
You expect more from Standard and you get it!

Quick facts about
STANICUT Oil 208 BCS

- Contains maximum amounts of sulfur, chlorine and compounding.
- Viscous enough to stay on large tools; fluid enough to flow easily, give good cooling.
- Can be used straight or diluted.
- Will not separate, become rancid or develop deposits.
- Non-irritating, non-corrosive, non-toxic.

Chicago Gear president Bob Weber (right) and Standard's Dick Erickson talk over cutting oils in front of company's new Pfauter P-2500 gear machine. Machine uses only STANICUT Oil 208 BCS cutting fluid.

THE SPECIALIST



The component specialist works with all his energy in a restricted field—striving through continuing research to approach perfection. Being both artisan and artist, he is never content to "Let Well Enough Alone." Thus, Progress is achieved.

The vehicle manufacturer is vitally concerned with his end product, the vehicle—concerned with the dependable flow of production and with costs. He capitalizes on the progress achieved by the Specialist.

King-Seeley has for 40 years specialized in automotive control devices. To King-Seeley engineers is due much of the credit for the major developments in this field.

K-S AUTOMOTIVE DEVICES

- Telegages
- Instrument Panels
- Speedometers
- Governors
- Signals
- Servos
- Auto Clocks

KS

KING-SEELEY DIVISION

OF THE KING-SEELEY CORPORATION

ANN ARBOR, MICHIGAN

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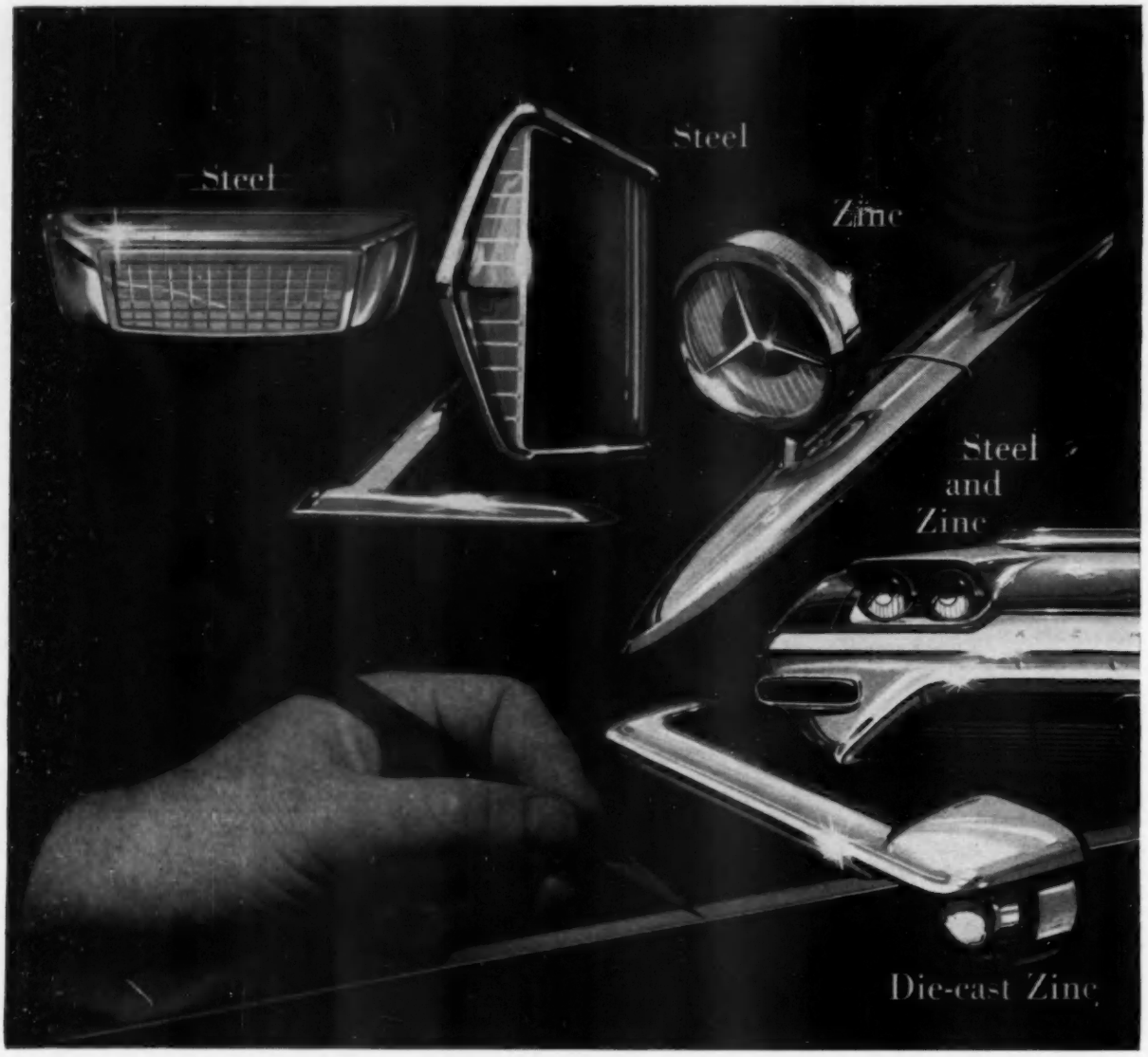

Choose any basis metal you desire and give it

a lustrous, lasting finish of Nickel-Chrome Plating!

Nickel-Chrome Plating provides a practical way to combine the beauty and protection of Nickel and chromium with the special properties of other metals:

- formability of brass
- strength of steel
- extrudability of aluminum
- lightness of magnesium
- conductivity of copper
- design flexibility of zinc-base die castings

Today's adaptable Nickel-Chrome Plating gives you the freedom to use a wide variety of basis materials to achieve the most desirable combination of performance, fabricability *and* practical cost.

Select the basis material that proves most suitable. Nickel-Chrome Plating will give it lustrous, matching beauty with brilliant blue-white color. Beauty with outstanding durability, too.

That's because Nickel-Chrome Plating not only provides shining sales appeal, but also protects basis metals from rust and corrosion. Protects basis materials from nicks and scratches. Makes the lustrous beauty lasting beauty.

So with Nickel in ample supply as far into the future as any man can foresee, there's no better time than now to use Nickel-Chrome Plating to your product's best advantage. Whether you want smoothing action, blue-white brilliance or satin tones—together with long-lasting protection—there's a Nickel coating to fit your requirements.

For information on accelerated corrosion testing of plated coatings, just drop us a card for your copy of "CORROSION TESTING OF ELECTRODEPOSITED COATINGS."

The International Nickel Company, Inc.
67 Wall Street New York 5, N.Y.

Inco Nickel

Nickel makes plating perform better longer

Circle 105 on Inquiry Card for more data

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JULY 1, 1960

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 123 No. 1

Features • • •

▼ **The Inside Story of Cadillac Quality**

The description of operations on the Cadillac cylinder head by Harold G. Warner, Cadillac General Manager and GM vice president, combines brevity with exposition adequate to provide a virtually complete case study. Page 33

▼ **Trends in Special Purpose Machine Tools**

Higher speeds and feeds, fully automatic loading, transferring, and unloading devices on machines, as well as electrical and hydraulic control systems are discussed by Howard N. Maynard, president of Snyder Corp. Page 40

▼ **SPI Automotive Conference**

Current and potential applications for cellular plastic foams were thoroughly explored at the Automotive Conference of the Society of the Plastics Industry held in Detroit last month. Page 45

▼ **Armored Vehicles in America's Future Part II**

Armor of the future must be equipped with weapons having greater capabilities than those on present-day armor. Some of the developments are described in this second part of a two-part article. Page 46

▼ **Reports from Machine Tool Builders**

Special reports to AUTOMOTIVE INDUSTRIES from 35 leading machine tool builders are analyzed and summarized. The machine tool industry is conservative in predicting prospects for near-future business improvement. Page 48

▼ **SAE Summer Meeting**

The Summer Meeting of the Society of Automotive Engineers featured 34 sessions at which 79 technical papers were presented. Some of the high spots are discussed in an article by Charles A. Weinert. Page 50

▼ **Automatic Balancing of Parts**

The Research Laboratories of General Motors Corp. have developed a new technique for the static balancing of rotating parts. This method indicates the amount and location of unbalance; also makes the correction. Page 53

▼ **21 New Product Items and Other Features Such as:**

Machinery News, Metals, Airbriefs, and Our Washington Wire.

. . . continued on next page

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MEMBER SBME Society of Business Magazine Editors

NBP National Business Publications, Inc.

BPA Business Publications Audit of Circulation

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1902; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES, Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Second Class Postage Paid at Philadelphia, Pa. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 50¢. Statistical Issue $2.00 and Products Guide Issue, $1.00, net.

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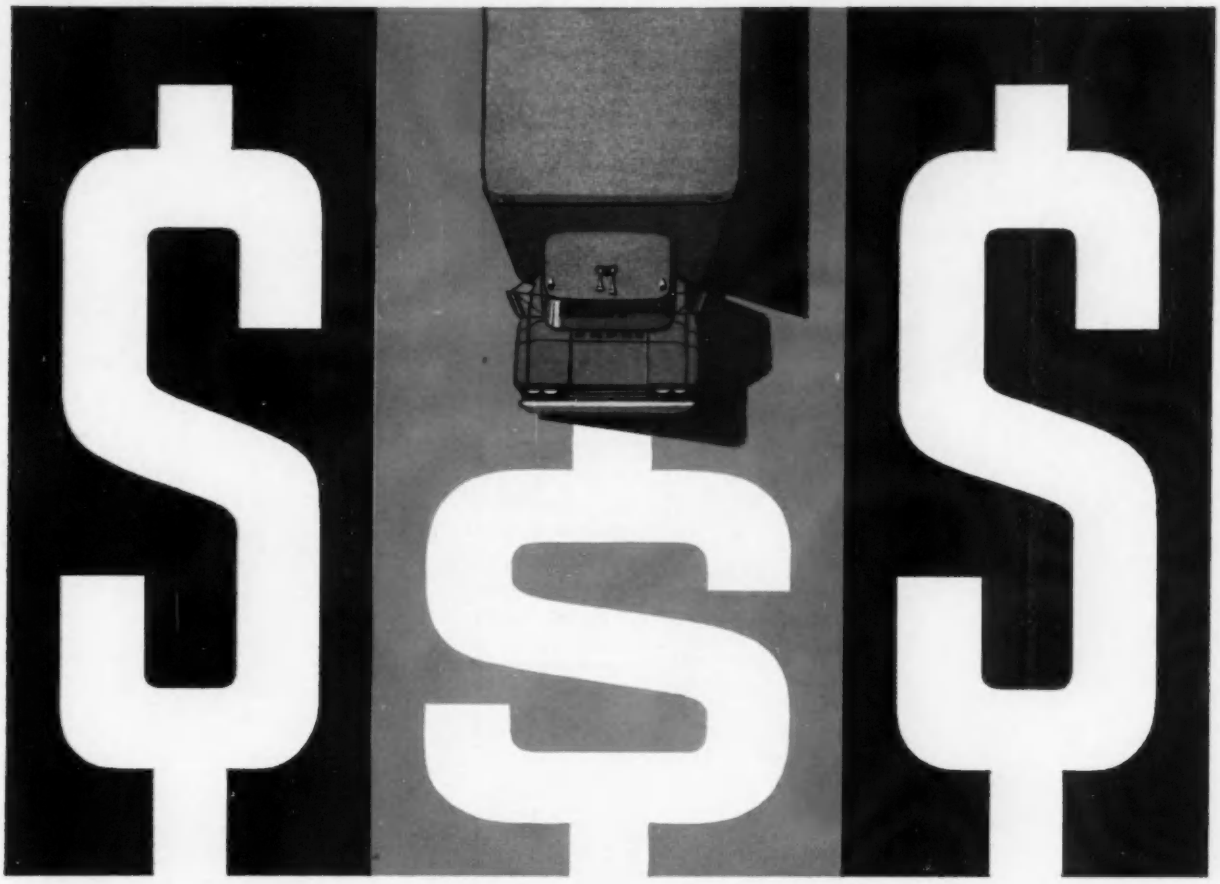


LOWER PRICE WITH BENDIX HYDROVAC® POWER BRAKES

Vacuum is the most popular power brake type by a big margin—and, among vacuum power brakes, Bendix Hydrovac is specified more often than all other makes combined. One big reason why over 5½ million Hydrovac units have been sold is that they save money. They cost less to buy . . . less to maintain. Any way you look at it, whether you build, buy, sell, or operate trucks, you'll find it pays to specify Bendix Hydrovac—the best in power braking.

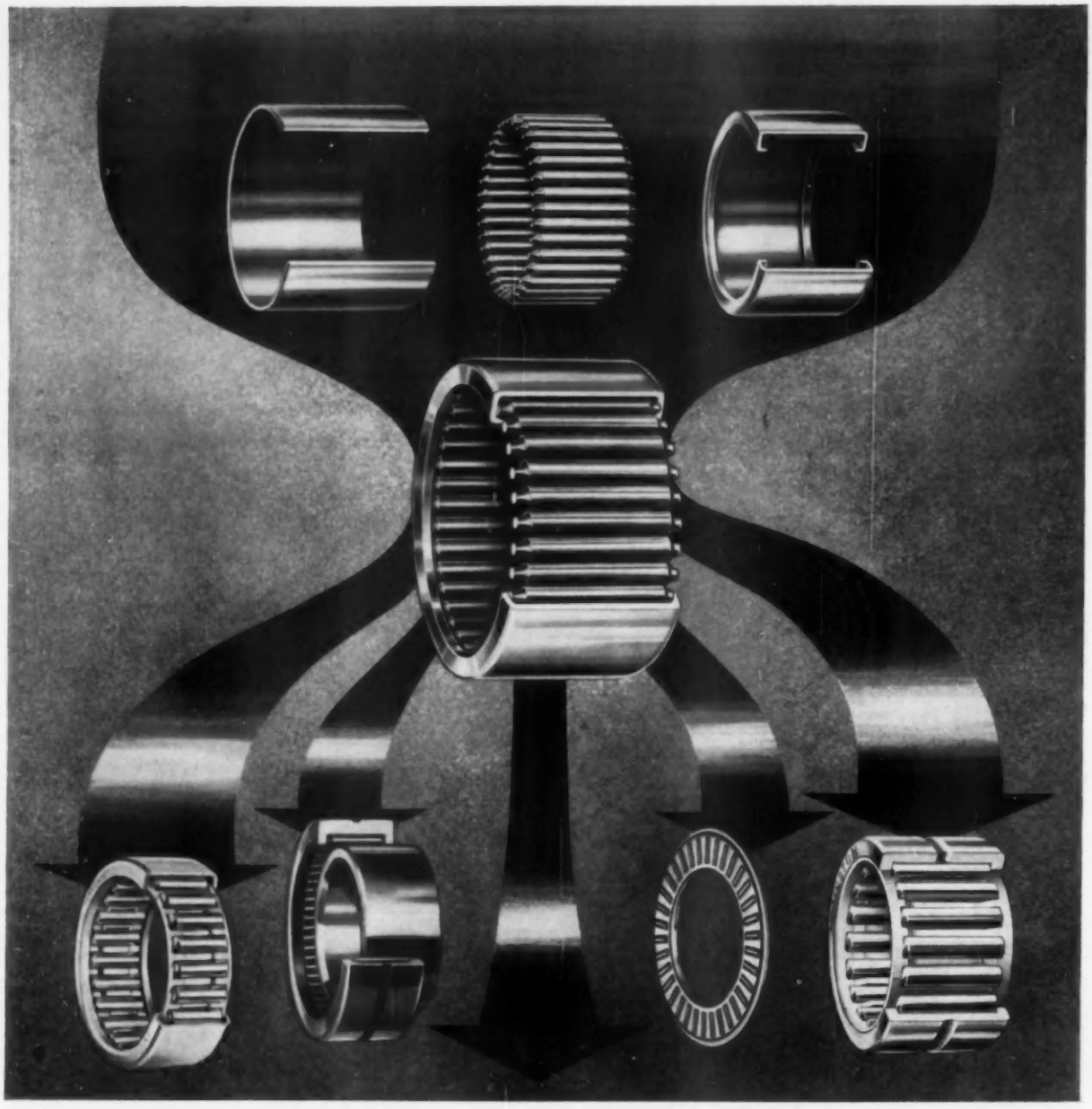
PROTECTION—Hydrovac furnishes maximum dependability—with built-in safety standby of manual braking in case of power failure.

PAYLOADS—Hydrovac weighs considerably less, permitting up to several hundred pounds more payload—and thus adding to profit.

More Bendix Hydrovac vacuum power brakes are in use than all other makes

Bendix PRODUCTS DIVISION South Bend, IND.

THE Bendix CORPORATION



PROGRESS REPORT. . .TORRINGTON NEEDLE BEARINGS

A drawn cup, a full complement of small diameter rollers, a turned lip – these simple elements of the Torrington Needle Bearings have made invaluable contributions to the improvement of countless products in simplicity, economy and reliability.

And from these basic elements, Torrington has evolved other types to meet modern engineering demands. Add an ingenious stamped steel retainer, and you have the new Drawn Cup Roller Bearing, a refinement especially suited to extreme speeds or once-a-lifetime lubrication. Thicken and carburize the race, and you have the new Heavy Duty Roller Bearing with its exceptional shock resistance. Take the small rollers, sandwich them between two interlocking disc-like retainers, and there is the new Needle Thrust Bearing, anti-friction companion in compactness and economy to the Radial Needle Bearing.

These are only a few of the recent developments in Torrington Bearings and are typical of Torrington's continuing efforts to improve bearings in design, material and performance.

THE TORRINGTON COMPANY

Torrington, Conn. • South Bend 21, Ind.

RESEARCH FOR PROGRESS IN BEARING DESIGN AND PERFORMANCE

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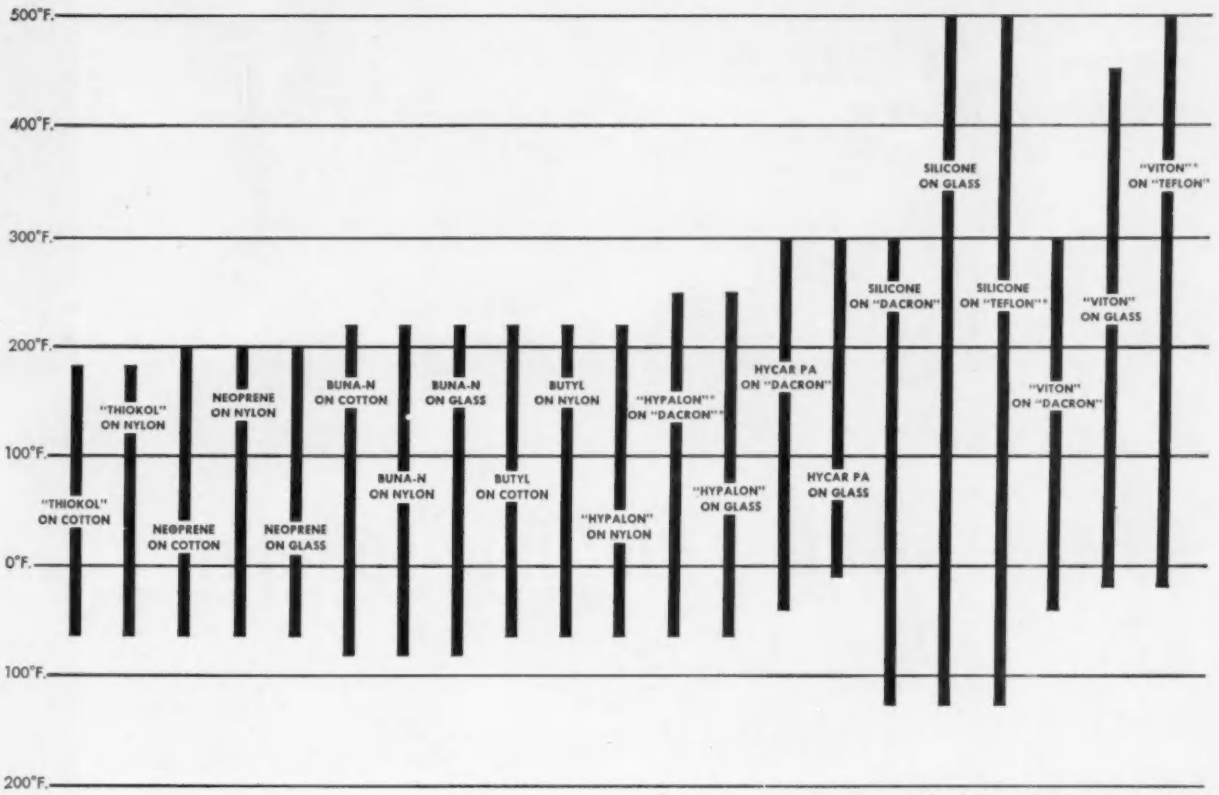

Upper serviceable limit is the highest temperature at which the material can be folded 180° back upon itself without cracking after 72 hours' exposure. Low limit is the lowest temperature at which the material can be bent around a 1" mandrel after 1 hour's exposure.

Temperature effects on the serviceability of Du Pont Fairprene®

Charted above are the serviceable temperature ranges for many of Du Pont's "Fairprene"* coated fabrics. These materials form design materials of amazing versatility with an outstanding range of lubricant, solvent, flex, ozone, age and chemical resistance as well as thermal stability.

Du Pont engineers are eager to help you evaluate "Fairprene" for designing new products or improving old ones. These versatile materials are now being used in hundreds of applications ranging from fire walls to gaskets and diaphragms. For full information and your free copy of Du Pont's coated fabrics manual, mail coupon or write: E. I. du Pont de Nemours & Co. **(Inc.), Fabrics Division AI-07, Wilmington 98, Delaware.**

**A Du Pont registered trademark.*

FREE COATED FABRICS MANUAL

12-page booklet describes in detail all basic specifications, properties, uses and performance characteristics for "Fairprene"* coated fabrics and cements. Mail coupon or write Du Pont . . . there's no obligation.

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Better Things for Better Living . . . through Chemistry

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Name_____ Position_____

Company_____

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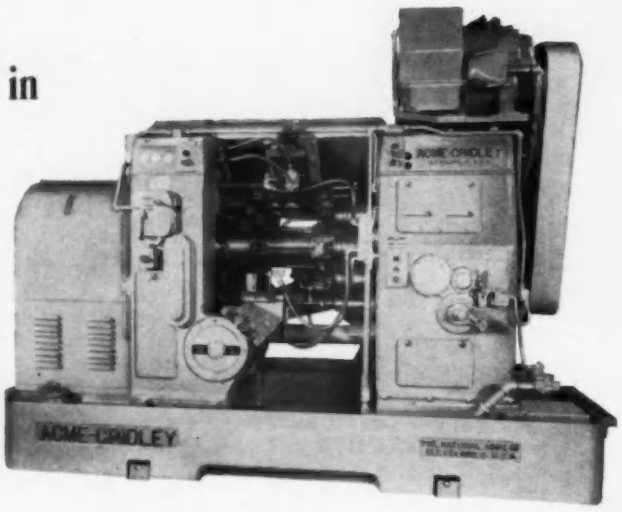
Major breakthrough in shaft production . . .



Acme-Gridley multiple-spindle shaft machine equals output of four automated lathes

At Chrysler Corporation's Trenton, Michigan, Engine Plant, a remarkable new National Acme shaft turning machine has slashed camshaft production costs; is hailed as a major production development for the entire industry. Performing complete shaft journal machining in a single set-up, this rugged 6-spindle automatic provides substantial savings in floor space and capital outlay, reduces scrap loss and enables closer control of machining operations.

Key to this dramatic pay-off are imaginative National Acme solutions to the difficult problems of centering, driving, and stabilizing the long, flexible shaft during turning operations. An ingenious part-holding technique exposes bearing journals for turning—an impossibility in a chucking set-up.

Extreme capability is stressed in the design of the Universal Multiple-Spindle Shaft Turning Machine and permits the maximum number of machining operations to be performed on straight or flanged shafts held between centers.

The shaft turning machine is additional evidence of National Acme know-how applied to the solution of special machining problems. This same insight and ability is available to any manufacturer interested in reduced costs and increased production. Our representative is as close as your telephone.

National Acme's "Zone of Responsibility" includes all phases of cost reduction. Check YOURS . . . Then Check National Acme

Direct Costs: these include direct dollar savings as realized by Chrysler Corporation . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.

National Acme

MMT-PE

The National Acme Company
181 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

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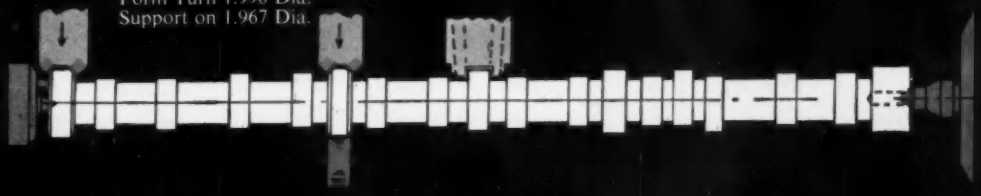
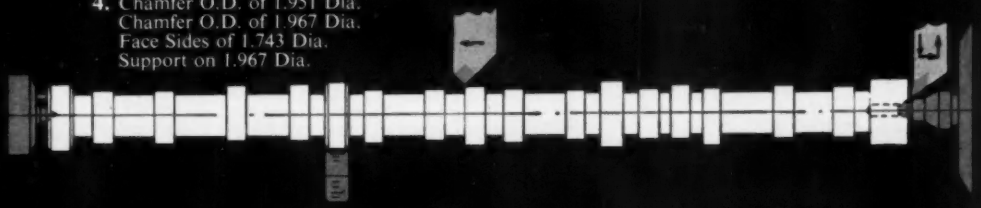
1st position—load and unload

2. Form Turn 1.951 Dia.
Form Turn 1.967 Dia.

3. Form Turn 1.982 Dia.
Form Turn 1.998 Dia.
Support on 1.967 Dia.



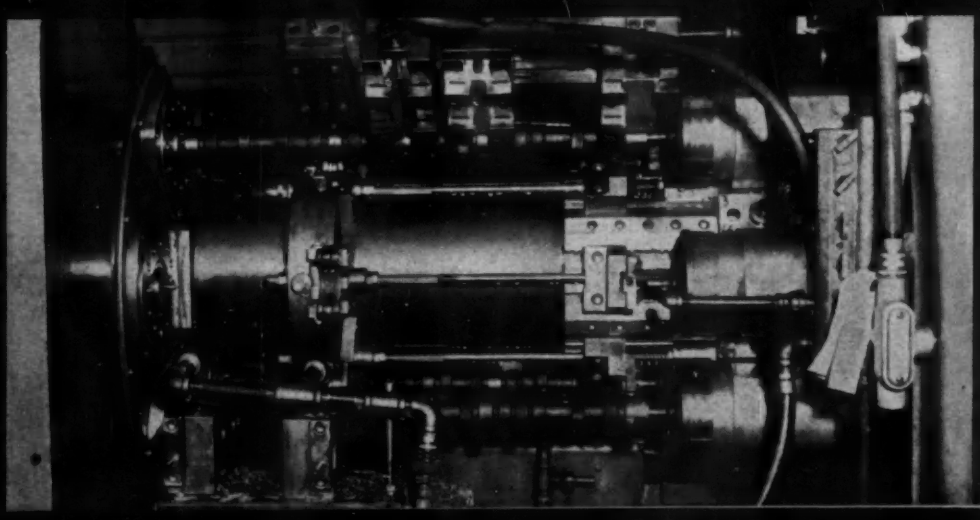
4. Chamfer O.D. of 1.951 Dia.
Chamfer O.D. of 1.967 Dia.
Face Sides of 1.743 Dia.
Support on 1.967 Dia.



5. Face End of Camshaft
Relieve Turn 1.743 Gear Dia.
Support on 1.967 Dia.

6. Chamfer O.D. of 1.743 Dia.
Chamfer O.D. of 1.982 Dia.
Chamfer O.D. of 1.998 Dia.
Support on 1.967 Dia.

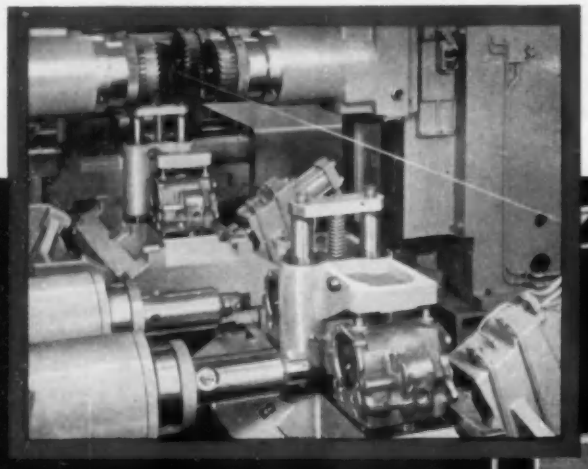
High-test cast iron camshaft with journal machining completed . . .
13 operations in 22 seconds.



Close-up of tooling zone. Open spindle in load and unload position shows unique centering, holding and driving mechanism.

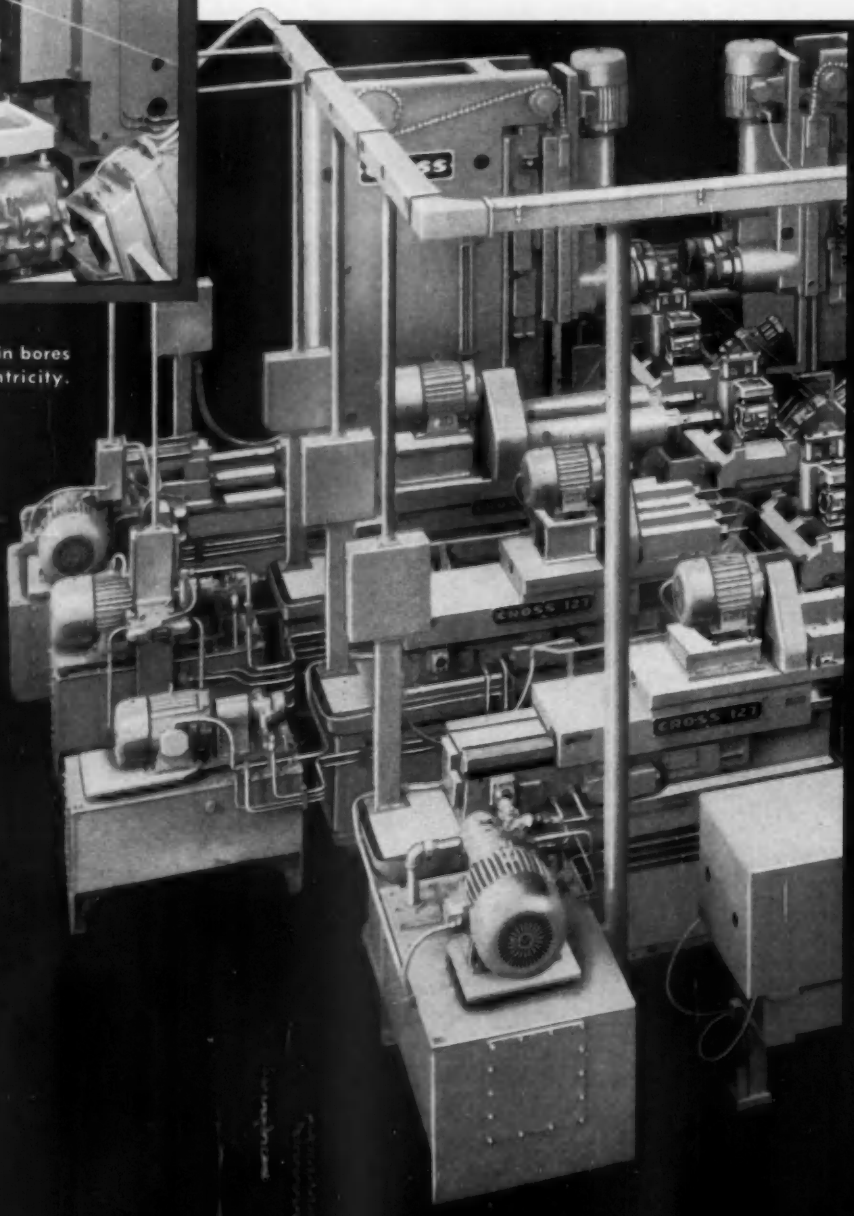
Cross Introduces Automation for High Precision Boring and Facing

Many Unusual Features in New Transfer-matic for Machining Transmission Cases



Finish boring the front and rear main bores with one bar to assure concentricity.

Operations include boring the main shaft, counter shaft, reverse idler, and two shifter rod bores and precision facing both ends.



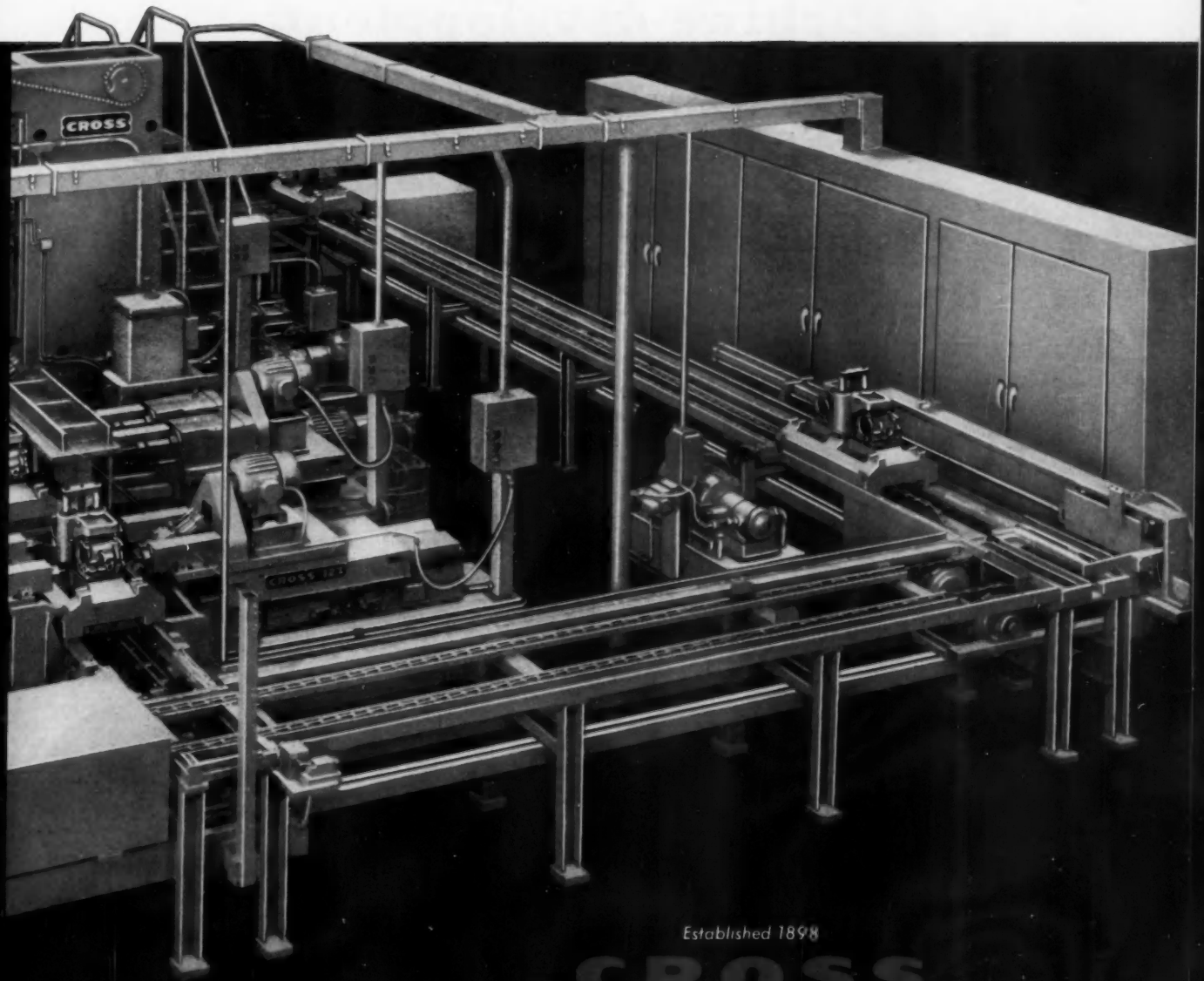
Another Automation First by Cross

An unusual new Transfer-matic which applies the production economies of automation to high precision finishing has been designed by Cross. It bores and faces transmission cases at a rated capacity of 140 parts per hour despite the rigid accuracy.

Some bore sizes are held to tolerances of plus or minus 0.00035 inch and chordal dimensions between three holes are held within plus or minus 0.001 inch. Squareness between the ends and bores is maintained to 0.0005 inch. Surface finish specifications are 56-110 micro-inches, rms.

A number of special features have been developed to assure this high precision. Center bases and wings are integral to obtain the rigidity necessary for maintaining precision alignment. Pallet locating is designed to assure extreme accuracy from station to station. Strategically placed air jets check the position of the pallets in each station.

A Cross sales engineer will be glad to explain details of this unusual Transfer-matic and other Cross innovations.

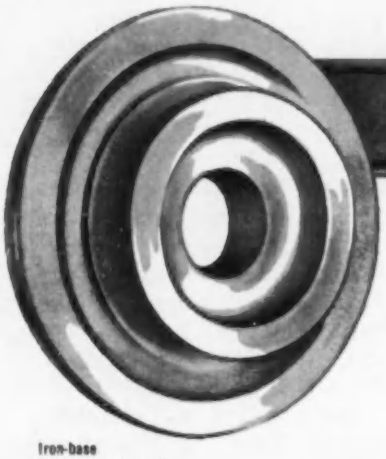


Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

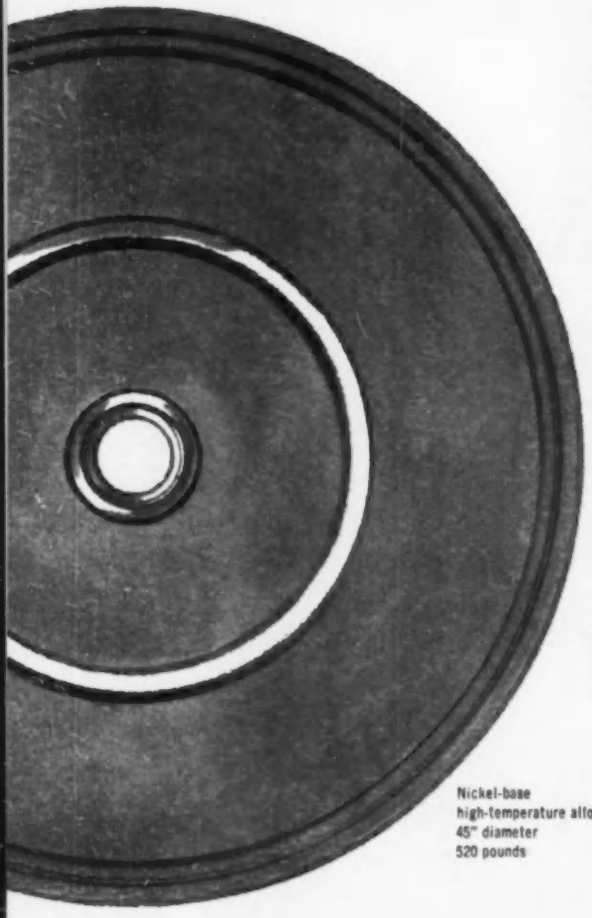


Iron-base
high-temperature alloy
21½" diameter
244 pounds

FORGED

Titanium
24½" diameter
191 pounds

To speed the progress of gas turbine development



Nickel-base
high-temperature alloy
45" diameter
520 pounds

For applications ranging from automotive to aircraft propulsion, Wyman-Gordon is the world's largest producer of forged components for the gas turbine industry—turbine wheels, compressor discs, blades and vanes, for stationary turbines, nuclear installations, aircraft and missiles.

Wyman-Gordon's production experience includes forgings of a wide range of metals from low-alloy high-strength steels—titanium—intermediate temperature alloys—to the super-nickel-base alloys and refractory metals. *Guaranteed minimum properties* assure improved performance and dependability, and enable designers constantly to raise their sights and increase turbine capabilities.

With unexcelled research and production laboratories to concentrate on your development problems and with hammer and press capacity unequalled in the country, Wyman-Gordon is prepared to serve you in great depth at the design, engineering and purchasing stages of your requirements.

Titanium
15½" length

EST. 1883

High-strength steel
19" diameter
143 pounds

WYMAN-GORDON

FORGINGS

of Aluminum Magnesium Steel Titanium . . . and Beryllium Molybdenum Columbium and other uncommon materials

HARVEY ILLINOIS WORCESTER MASSACHUSETTS DETROIT MICHIGAN

GRAFTON MASSACHUSETTS LOS ANGELES CALIFORNIA PALO ALTO CALIFORNIA FORT WORTH TEXAS

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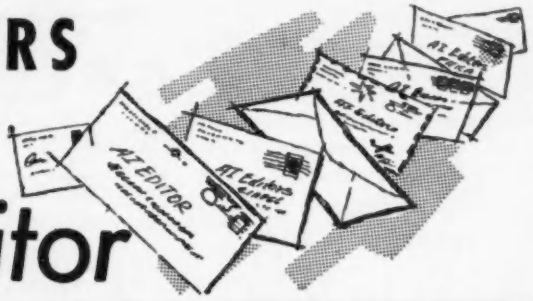
LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

INDUSTRIAL ENGINES

Your article in the May 1 issue, "Expanding Demand for Industrial Engines," fits right into our heavy engine parts sales program.

Would it be possible to receive about thirty reprints of this article, billing us of course.

Tom Brown
General Sales Manager
White Machine Works
Superior-Arrowhead, Burd Engine Parts
Eau Claire, Wis

● *No reprints of the article are available, but we will be happy to supply you with thirty copies of the magazine—Ed.*

STATISTICAL ISSUE

The reason for writing is that we have not received the special statistical issue. You understand that this issue is important to us in that it gives us detailed technical specifications regarding competitive makes.

A. Sauter
Advertising & Sales Promotion
Societe Anonyme Chrysler
Antwerp, Belgium

● *The Statistical Issue is on the way—Ed.*

PLANT MANAGEMENT TRAINING

General Motors Institute Plant Management Training Department conducts Reading Improvement Programs on an in-plant basis throughout the country.

At this time we feel that certain revisions should be made in the selections for class reading. The current material has become somewhat dated. I have been very interested in a number of your articles, and I would like to be informed of the procedure I must follow to secure the right to reprint the material.

This would be an excellent advertisement for your magazine since GM executives would be reading the articles.

Thank you for your kind attention, and I hope to hear from you in the near future.

Howard F. Lund
GMI Representative
Allison Div., GMC
General Motors Institute
Flint, Mich

● *Permission is granted to reprint anything provided full credit is given to* AUTOMOTIVE INDUSTRIES—*Ed.*

CARBONYL PROCESS

Many, many thanks for your very fine coverage of our new division and Carbonyl Nickel products.

It was indeed one of the best articles we have seen to date and I believe it is equally important to you and your magazine as it is to The Budd Company.

L. S. Schmidt
Public Relations
The Budd Company
Philadelphia, Pa.

ENGINE SPECS

Thanks very much for sending us the new engine chart. The information contained in it is always useful in our work.

I also wish to compliment you on Mr. Kay's recent article on Indianapolis.

Leon Goosen
Design Engineer
Meyer & Drake Engineering Corp.
Los Angeles, Calif.

TO MEET YOUR REQUIREMENTS

STANDARDIZE 100% ON Southern FASTENERS

Just name your fastener requirements. Chances are that the screw or bolt you need now is in Southern Screw's stock of 1,500,000,000 pieces—and in the exact size, head style, material, and finish you want. If special plating is one of your requirements, Southern has its own plating department.

Perhaps price is a big factor. Remember; in the final analysis, the best cost less. Southern fasteners are the best you can buy.

Why not see for yourself how USA-made Southern fasteners can meet your requirements. Get in touch with your nearest Southern Screw distributor, or write Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

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Men who know and specify special fasteners depend on this familar symbol . . . CP . . . the famous Chandler hallmark for precision and reliability in fasteners. It's your guarantee that each fastener meets the rigorous materials and performance tests required by industrial and military standards. Before placing your next order . . .

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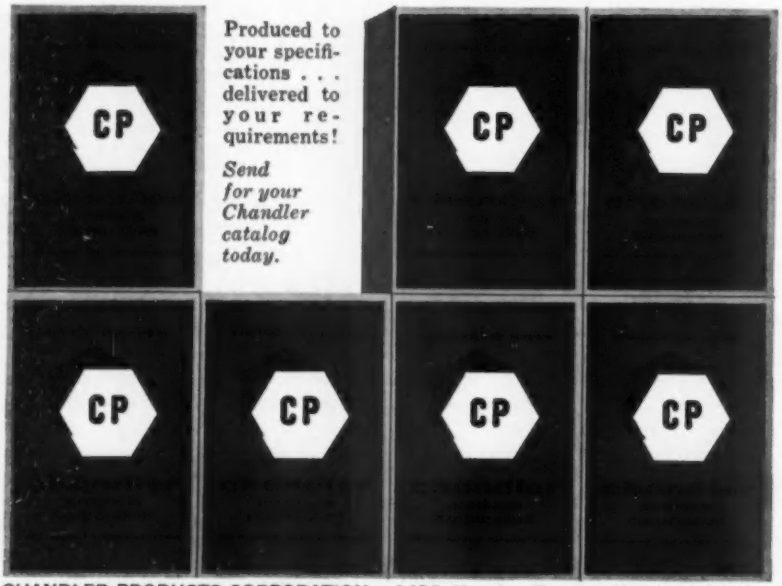

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CALENDAR

OF COMING SHOWS AND MEETINGS

1960 Western Packaging & Materials Handling Exposition, Los Angeles .....July 19-21

11th Annual Industrial Research Conference, Harriman, N. Y. Aug. 7-13

American Astronautical Society, Western National Meeting, Seattle .....Aug. 8-11

Summer Institute, Non-Destructive Testing, Sacramento State College .....Aug. 15-26

Western Electronic Show and Convention, Los Angeles.....Aug. 23-26

International Heat Transfer Conference, sponsored by ASME, American Society of Chemical Engineers, and IME, ICE (British) .....Aug. 28 to Sept. 1

Machine Tool Exposition — 1960 (sponsored by National Machine Tool Builders' Assn.), Chicago Sept. 6-16

Production Engineering Show, Chicago .....Sept. 6-16

2nd Coliseum Machinery Show, Chicago .....Sept. 7-15

ASME Engineering Management Conference, Cambridge, Mass. Sept. 7-9

Fall Meeting, Material Handling Institute, Virginia Beach, Va. Sept. 12-13

Steel Founders' Society of America Fall Meeting Hot Springs, Va. Sept. 18-20

AWS, National Fall Meeting, Pittsburgh .....Sept. 26-30

SAE, National Aeronautic Meeting, Los Angeles .....Oct. 10-14

Cast Bronze Bearing Institute, 1960 Annual Meeting, Asheville, N. C. Oct. 12

Magnesium Association Annual Convention, Cleveland .....Oct. 17-18

42nd National Metal Exposition and Congress, Philadelphia ....Oct. 17-21

SPI. "Tooling for the Plastics Industry," New York City.....Oct. 19

1960 Fleet Maintenance Exposition, New York City.....Oct. 24-27

15th Annual Technical Convention, American Society of Body Engineers, Detroit .....Oct. 26-28

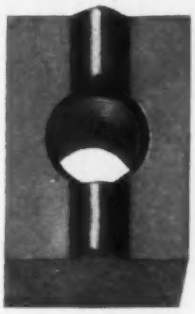
Material Handling Institute Show, Louisville, Ky. .....Nov. 1-3

ASTME, Western Tool Show, Los Angeles .....Nov. 14-19

Automotive Electric Association, 43rd Annual Meeting and 24th Annual Mfg.-Dist. Conference, Chicago .....Dec. 2-9

Circle 112 on Inquiry Card for more data

ACCURACY, DURABILITY and ECONOMY are important characteristics of these sintered metal automotive suspension parts by Delco Moraine. Vital components such as these are typical results of close collaboration between Delco Moraine and its customers—an effective liaison that functions from idea through design and development to production. They also confirm Delco Moraine's equally important capabilities for making deliveries in quantity and on time!



DELCO MORAINE

DEPENDABLY MADE *parts for automotive progress • Division of General Motors, Dayton, Ohio*

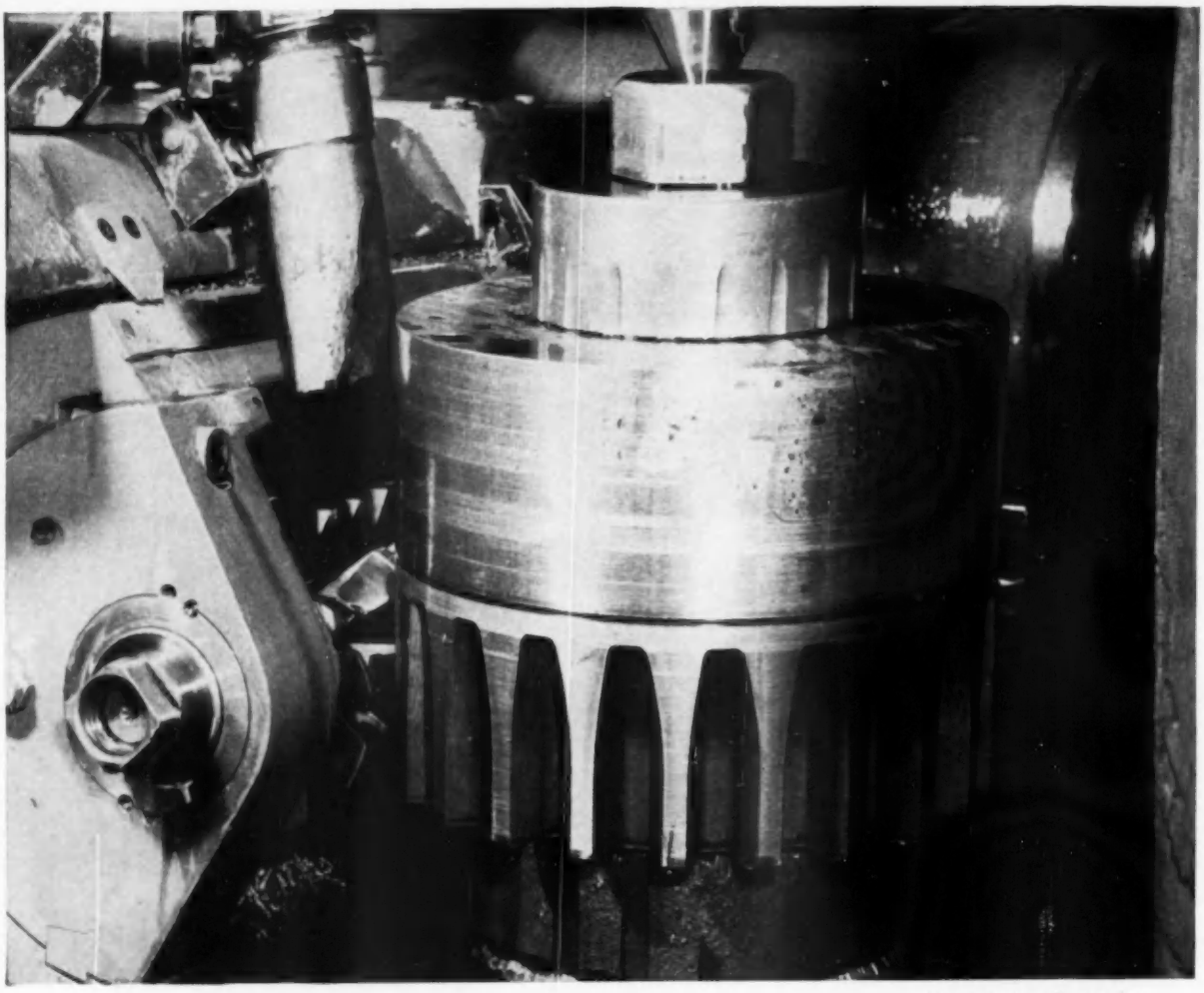


Photo courtesy Boston Gear

Aristoloy Leaded increases hob speed 50% . . . prolongs tool life 50% for Boston Gear

Together these add up to 100% satisfaction with Aristoloy Leaded* steel. By switching to Aristoloy Leaded, Boston Gear now machines three 7" Spur Gears per hour. Best production achieved on the steel previously used was two per hour.

With Aristoloy Leaded, 24 gears are cut before the hob needs sharpening . . . only 16 were possible with other steel used by Boston Gear.

Strength and hardness of the finished part show no detectable difference in physical properties from the unleaded steel used earlier.

For complete information about Aristoloy leaded or standard analyses carbon, alloy, and stainless grades, write for booklet entitled, "A Complete Line of Leaded Steels," and new Products and Facilities Catalog.

*Inland Ledloy License

ARISTOLOY STEELS

DIVISION OF
COPPERWELD STEEL COMPANY

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NEWS

Vol. 123, No. 1 July 1, 1960

2d Half Outlook Bright

Medium Price Lines Await 4 New Compacts

By Hugh C. Quinn, Detroit Regional Editor and C. B. Campbell, News Editor

How does 1960 shape up for the automobile industry at the halfway point?

Generally speaking, things look pretty good with six months of the year gone.

The first half of 1960 was as good as the most optimistic forecasters said it would be—and, in some respects, even better. And the outlook for the balance of the year is bright, although things promise to get a little hectic about the middle of October.

Sales and production ran along at a brisk pace during the first six months, with only minimum loss of time from labor strife. Manufacturers were able to build their cars just the way they had them scheduled—except when they could not build them fast enough.

Compacts Steal Show

The compacts stole the headlines. Falcon and Rambler have been running a wheel-to-wheel race for production leadership in this rapidly growing market segment, and Valiant just recently moved into third place ahead of Corvair. Comet, a late starter, already has moved ahead of Lark.

And everyone concerned seems to be pleasantly optimistic about the impending arrival of four more new compacts in the fall.

William L. Mitchell, GM vice president in charge of styling, displays 1960 Industrial Designers Institute Gold Medal for design of the Chevrolet Corvair.

Passenger car production at the midway mark is slightly more than 3.8 million units, or roughly 15 per cent ahead of last year. Commercial vehicle production of nearly 700,000 units was about 10 per cent over last year.

Million Unsold Cars

Sales are ahead of last year, too. But the fast production pace has built up an inventory of more than a million unsold cars, a record for this time of year.

The heavy field stocks, plus early introduction of all 1961 models, will lead to some frantic late summer competition, with plenty of horse trading, to make room for the new models.

An idea of what might happen with the four new compacts can be picked up from the overnight success of the Comet, Ford Motor Co.'s answer to those customers who think the Falcon is a little too austere. Comet production schedules have been pegged up steadily, with more assembly facilities due to go into operation later in the summer.

Valiant has been another one that apparently fooled even its backers. Chrysler Corp. had to schedule additional assembly lines for Valiant to keep up with the sales demand. Rambler has been working three shifts to meet de-

DISCUSS TRANSISTORIZED IGNITION

Cecil S. Allen (left), Director of Engineering, Electrical Products Div., Electric Autolite Co., discusses installation of transistorized ignition system on test car with George E. Spaulding, Autolite research director. They spoke at Milwaukee School of Engineering in first of ignition seminar series.

mand, and production topped high-flying Falcon by barely 10,000 cars.

Corvair has not met with the same success as the other new compacts, but Chevrolet can rightly say that it's satisfied. While sales of the big Ford and Plymouth are down from last year, sales of the big Chevrolet are up, which means that every dollar of profit earned on a Corvair is pure gravy.

Lark Output Down

Only Studebaker-Packard has had a disappointing year with its compact. Lark production is about 30 per cent behind last year.

Dodge, buoyed by the lower-priced Dart, is enjoying a good year. Dodge sales are more than double the year-ago sales, and the lowest-priced Seneca series accounts for better than 35 per cent of all Dodge sales.

This could indicate the climate is right for the upcoming compact Dodge Lancer. The two 122-in. wheelbase series, Matador and Polara, are taking scarcely 14 per cent of all sales.

The climate also should be right at Buick, Oldsmobile and Pontiac for introduction of their new compacts—but for a different reason. All three divisions could use a boost in sales. Pontiac sales are about even with last year, and Olds sales are down slightly. Buick sales are up from last year, but still below potential.

Big Cars May Drop

The GM medium price dealers probably will go all-out with their new compacts next fall, and the big lines may suffer additional losses to their little brothers. But the end result—total sales of compacts and big cars—should be worth the shift in emphasis.

Chrysler, of all the corporations, experienced the happiest moments during the first six months. Dodge and Chrysler sales were well up from last year, while De Soto and Imperial, the two low-volume sellers, dropped off slightly. The result was a 40 per cent increase for the corporation, and a boost in market penetration from 12.4 per cent at the end of 1959 to better than 17 per cent in June.

Byron J. Nichols, group vice president—sales, said the company registered a gain each month since the beginning of the year, and surveys indicate that consumers' intentions to buy will continue strong. Current sales momentum will carry into the second half of the year, according to Mr. Nichols.

George Romney, American Motors president, believes the four new compacts will increase interest in Rambler's Rebel V-8 and Ambassador, which now account for less than nine per cent of Rambler sales.

New Maltese Concern To Assemble Ramblers

A new Maltese company will begin assembling Rambler automobiles later this year for distribution in areas of Africa and the Middle East. The firm, Rambler Automobile Assembly, Ltd., is erecting a $700,000 plant at Marsa. Malta, and is planning an annual volume of 6000 vehicles.

Victor Cassar-Reynaud, board chairman of the new concern, says it will be the first heavy manufacturing venture in Malta. Cars will be assembled from components shipped from the American Motors plant in Kenosha, but the company will encourage local manufacture of parts.

Ramblers currently are being assembled in Mexico and South Africa. A wholly-owned subsidiary is tooling up for Rambler production in Canada.

Imports Increasing Despite U. S. Compacts

American compacts have failed to lessen the flow of foreign cars into the U. S., figures compiled by the Automobile Manufacturers Association reveal.

At the same time, fewer imported cars were sold in the U. S. in April than in April, 1959. This was the first time a decrease has been noted since imports became a factor in the American market.

Industry figures showed 48,283 imports sold in April, 1960, compared with 53,715 in April, last year. For the first quarter the 1960 total is still slightly ahead of last year's mark with 181,781 cars registered as compared with 1959's first quarter 179,759.

Of the top 10 imports, only Volkswagen, Renault and Austin-Healey were ahead of 1959 sales. Volkswagen sales of 52,294 this year compared with the 1959 first quarter total of 32,512. Volkswagen sales were nearly double the Renault figure.

Despite the sales decrease in April, the import flow is greater than in 1959. In the first four months of 1960, 231,638 foreign autos and 6962 trucks entered the U. S. Their value is in excess of $267 million. In the similar 1959 period 209,306 and 7489 trucks worth more than $245 million were shipped here. April imports were 54,521 cars and 1573 trucks worth more than $64 million.

In the first quarter of 1960, U. S. manufacturers shipped 47,570 cars and 62,099 trucks abroad. Their value exceeded $114 million. In April, 10,875 U. S. autos and 17,041 trucks were exported.

Western Germany, which for years has led in imports, has lost out to the United Kingdom in the first quarter. France continues in third place. Four-month import totals are: United Kingdom, 72,251; Germany, 71,437, and France, 57,926.

Dr. Leverett Named

Dr. Miles C. Leverett, manager, development laboratories for the General Electric Aircraft Nuclear Propulsion Department, Cincinnati, has been named president of the American Nuclear Society for 1960-61.

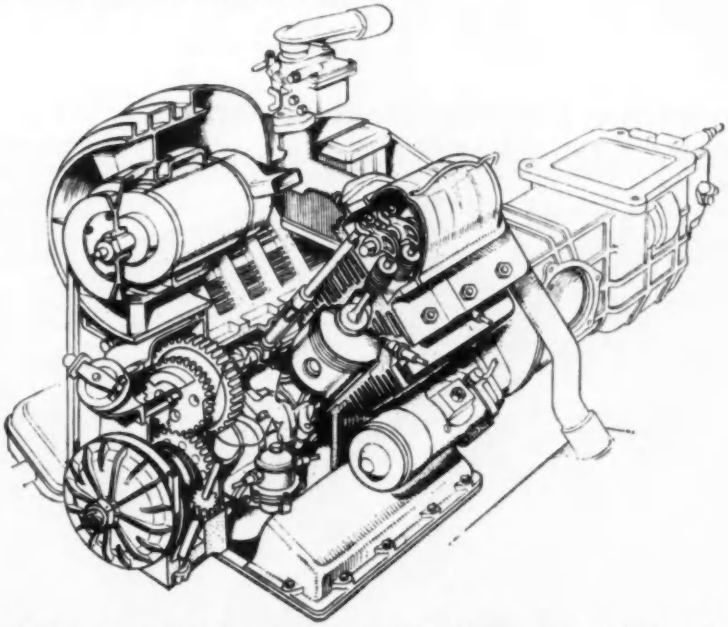
F-M Industrial Engine Orders Up 100 Pct.

A 100 per cent increase in industrial engine orders as compared with 1959 has been reported by the Beloit Div., Fairbanks, Morse & Co.

Inquiry activity, officials said, is approximately 30 per cent higher than for the like period last year.

The company also estimated that new business for the remainder of this year would run about 20 per cent ahead of the second half of 1959.

REDS CHANGE NAME AND ENGINE



Production versions of Russia's new, small Zaporozhe, known earlier as Communard (AI June 15, 1959, and Jan. 1, 1960) will be powered by V-4 engine of 45.5-cu in. displacement. It will develop 20 hp at 4000 rpm. Blower-cooled, it is formed in 90-degree V. Unbalance is corrected by counter-weighted secondary shaft centered in hollow camshaft and driven by the crankshaft through unity gearing running in the opposite direction. Bore and stroke are 2.6 in. and 2.18 in. and compression ratio is 6.6 to 1. This engine replaces flat-four copied from Volkswagen.

NEWS

CONTINUED

Israeli Plastic Autos, Trucks on Sale in U. S.

Israeli plastic-body station wagons, panel and pick-up trucks have entered the busy U. S. import market. A sedan and sports car are expected shortly.

Unveiling of the first of the line, the Sabra, was by Bryan Oldsmobile Co., Beverly Hills, Calif., first retail distributor in the U. S. signed up by Israeli-owned Autocars, Ltd., of Haifa. Bodies of the economy class cars and trucks are of reinforced fibrous glass. The four-cylinder engines, built by English Ford, develop 36 hp.

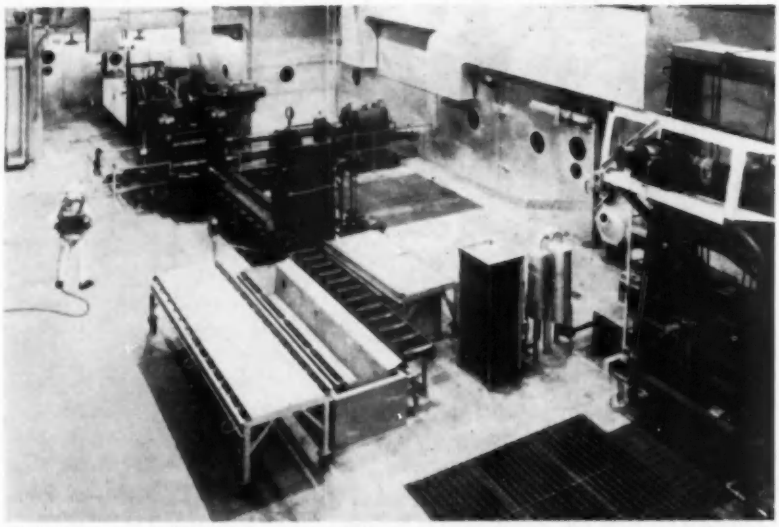
Due in August in Los Angeles is a more powerful two-place sports model to sell for about $3300 in Los Angeles. The station wagon, available now, is priced at $2098 on the West Coast. Trucks sell for about $1950. The four-door sedan is expected to arrive in the U. S. early next year.

Foreign vehicles now in the U. S. market are made in The Netherlands, Sweden, France, Great Britain, Ireland, Germany, Japan, Italy, Russia and Czechoslovakia. An Australian entry is expected to be announced shortly.

Battelle Promotes 2

Dr. Horace J. Grover has been named staff physicist in the Battelle Memorial Institute's Department of Mechanical Engineering, and George M. McClure has assumed Dr. Grover's former post as chief of applied mechanics research.

NEW FACILITY HOT-WORKS AEROSPACE MATERIALS



High-integrity fabrication of molybdenum and other refractory metals and their alloys has started in the "InFab" (inert fabrication) facility of Universal-Cyclops Steel Corp., Bridgeville, Pa. Metals are produced at "true" working temperatures up to 4500 F without oxidation. The pressure-type chamber contains an impactor, rolling mill and furnaces. It is filled with argon gas to prevent contamination. Technicians wear modified space suits.

Ford Introduces Second Compact Truck

Ford Div. has introduced a second compact truck, this one a parcel delivery chassis with a minimum wheelbase of 96 in. The new truck, labeled P-100, is 13.5 in. shorter than the compact Falcon Ranchero pickup introduced earlier this year (see AI, March 15).

The P-100 is powered either by the 90 hp Falcon engine or the standard 139 hp Ford truck engine. The truck also comes with a 102 in. wheelbase.

Ford is moving its P-100 into a healthy market. Wilbur Chase, truck marketing manager for the Ford Div., said in announcing the P-100 that Ford's parcel delivery truck sales in 1959 were the highest in history and nearly 54 per cent higher than 1958.

All AMA Officers Are Re-Elected

The Automobile Manufacturers Association re-elected all its officers for one-year terms at the AMA annual meeting in June. Renamed to the top spots were L. L. Colbert, chairman of Chrysler Corp., president; Henry Ford II, president of Ford Motor Co., and J. N. Bauman, president of White Motor Co., vice presidents; John F. Gordon, president of General Motors, secretary; and W. D. Schumacher, executive vice president of International Harvester Co., treasurer.

Two new directors were named to complete unexpired terms. They are Roy D. Chapin, Jr., executive vice president of American Motors, and Stephen A. Girard, president of Willys Motors, Inc.

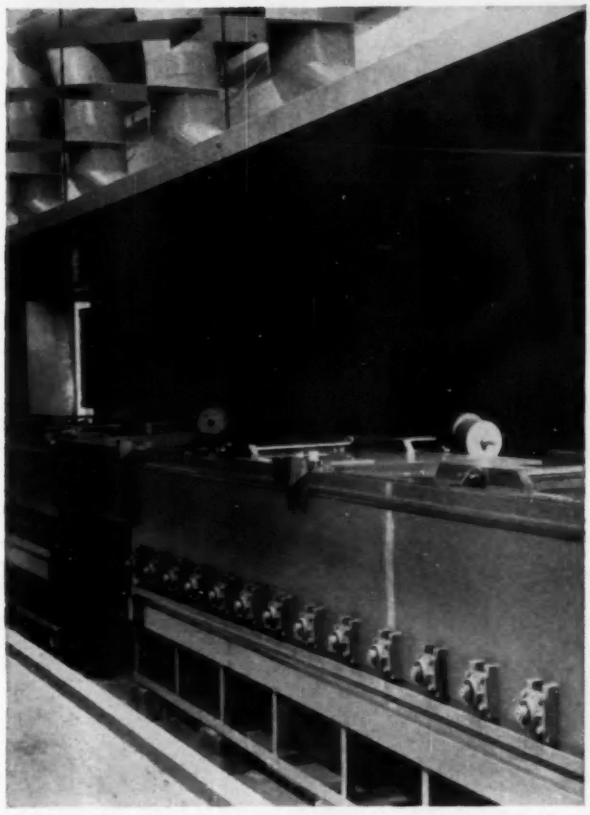
California Widens Registration Margin

California widened its margin as the leading state in motor vehicle registrations during 1959. Total California registrations at the end of the year was 7.4 million, an increase of 5.7 per cent.

The No. 2 state, New York, had a 1959 total of five million, a 2.2 per cent rise over 1959.

Another new development using

B.F.Goodrich Chemical *raw materials*



Complete acid etching machine of rigid Geon was developed by Industrial Plastic Fabricators, Inc., Norwood, Massachusetts. It is used by Corning Electronic Components, Corning Glass Works, Bradford, Pennsylvania, to produce Fotoform and FOTOCERAM® products like the circuit board shown. B.F.Goodrich Chemical Company supplies the rigid Geon vinyl.

Machine of rigid Geon produces low cost precision etching on glass

"Chemical machining" is the accurate term for the high precision etching on glass done by this new machine. Square-cornered, submicroscopic holes can be produced with small tolerances and close center-to-center distances. Or a precise pattern can be created in glass, whether it involves holes, cut-outs, or channels. Screens with mesh as fine as 560,000 holes per square inch have been produced.

The machine is made of shapes, sheets and rods made of Geon rigid vinyl. Geon is unaffected by the acids that do the etching job. It provides the durability and impact strength needed for fabrication. And it is as easy to handle as any material used for manufacturing.

Here's another example of the way Geon vinyl can open new markets or improve old applications. For more facts, write Department GT-4, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon VINYLS

B.F.Goodrich Chemical Company
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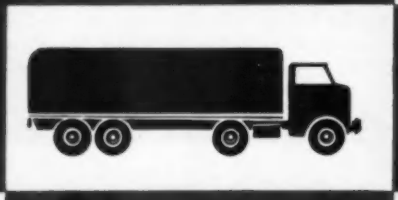

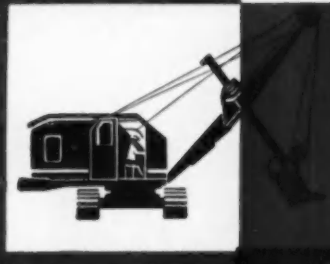

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NEWS

FEATURES

Multi-Fuel Engine Introduced by Rootes

A new engine which runs on high or low test gasoline, Diesel oil, kerosene, or jet fuels is being introduced to the U. S. by England's Rootes Motors.

The engine is said to be suitable for use in cars, trucks, buses, tractors, farm machinery, boats, many industrial applications such as electric power generation, and for contractors' equipment.

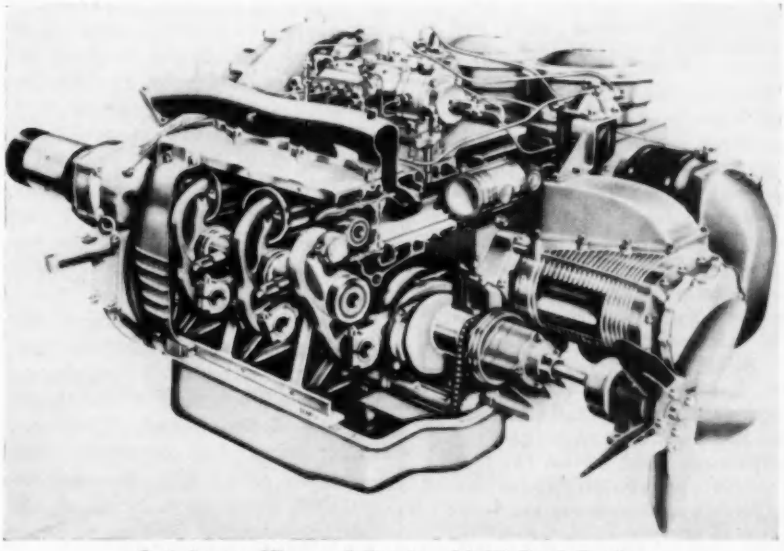
Main significance of the new Rootes engine is that it will allow utilization of the most economical kind of fuel available in any area.

The multi-fuel feature is particularly important when vehicles or machines are being used in remote areas where some fuels are scarce or intermittent in supply. This would be the case in many military or engineering-contracting applications.

The multi-fuel feature depends on a special type of variable pressure fuel injection system which varies the amount of fuel fed into the combustion chambers depending on the fuel being used.

The basic engine, a two-stroke, three-cylinder unit, is designed to deliver 105 brake hp. Variations in design allow 75 and 85 hp ratings as well.

The prototype of the multi-fuel engine is a Diesel unit which has been used as the standard power plant for the Rootes Commer line of commercial trucks.



Cut-Away View of Rootes Multi-Fuel Engine

Dr. Kucher Discusses Vehicles of Future

Here are some long-range projections on the future of the automobile—or rather, the vehicles that may replace the automobile as we know it today. Dr. Andrew. A Kucher, Ford Motor Co. vice president-engineering and research, says the next 40 years will produce a wide variety of vehicles that will include small urban commuter-cars, intercontinental highway cruisers and miniature coaches for short-range city and suburban travel.

In addition, there will be a new form of transportation — high speed wheel-less vehicles guided by rails and sliding on a thin film of air. Ford already has developed a small experimental air-cushion prototype called the Levacar, which glides on compressed air.

Dr. Kucher says the air car systems would be used for public transportation between cities, with traveling speeds ranging from 200 to 500 mph.

The Ford veep believes the greatest developments in the automotive field will come from three directions: energy, materials and controls.

He predicts that, by the end of the 20th Century, the industry will have developed fuels with a higher density of energy than gasoline, propulsion systems with higher power-to-weight ratios than present engines, and sensing and control systems capable of instant observation, registration and response.

AI TABLOID

Three scientists at the Army's Diamond Ordnance Fuze Laboratories in Washington have evaluated several aircraft collision-avoidance systems, and believe one such system offers the possibility of a 99 per cent reduction in air collisions. They report the Navigation, Air Traffic Control, and Collision Avoidance System offers a single integrated solution to the tri-fold problem of air navigation, air traffic control, and collision avoidance. The NATCAS system involves transmissions on a radio frequency proportional to a plane's altitude, and it "tunes in" other aircraft flying at adjacent altitudes. Frequency modulation is used to communicate hearing. The necessary vertical avoidance maneuver is computed from altitude information.

* * *

Use of synthetic lubricants by aircraft, both military and commercial, now amounts to about 2 million gal a year, as compared with 25 to 30 million gal of petroleum-based lubricants. Synthetic diester oils now cost only $3.50 to $4 per gallon. But oils needed by supersonic airliners may sell initially for $75 a gal because of the cost of their additives. Such oils will have to retain their viscosity and other desired properties at sustained temperatures of 400 F and intermittent temperatures of 600-700 F.

* * *

Monel nickel-copper alloy propeller shafts used to drive the three-ton hydroplanes competing in the Gold Cup Races turn at more than 13,000 rpm to propel these craft through the water at more than 100 mph.

* * *

The effects of radiation on aircraft lubricants, solid catalysts, and magnetic and ferroelectric materials are evaluated in three Air Force reports released to science and industry through the Office of Technical Services, U. S. Department of Commerce.

Testing is one of the major expense items for tire and rubber companies. Each year, Goodyear spends an average of $2½ million to test tires. Engineers run up 16½ million tire miles with laboratory testing machines and more than 58 million tire miles in testing on tracks, turnpikes and ordinary public roads.

* * *

The use of strong nickel-containing alloy steels in the underframes, posts and body sheets of trucks and trailers results in lighter weight, increased load capacity and lower maintenance costs.

* * *

Exports of crude aluminum from the U. S. in February totaled 85.1 million lb, a 78 per cent increase over the January figure of 47.9 million lb. Shipments of crude aluminum to West Germany were 33.5 million lb, against 9.2 million lb in January. Aluminum scrap exports increased 16 per cent to 11.8 million lb. in February, compared with January's 10.2 million lb.

* * *

U. S. consumption of new rubber amounted to 144,932 long tons in March, compared to 139,225 tons in February, 1959, and 147,200 tons in March, 1959.

* * *

Investigations to develop ultra high strength steels for use at temperatures up to 1200F, and low alloy steel compositions suitable for high strength steel castings are described in two Air Force research reports released to industry.

* * *

Headed by a $2.8 million increase in chain saw shipments, woodworking machinery exports from the U. S. in 1959 were 17 per cent above 1958 totals. Woodworking machinery exports totaled $21 million last year, compared with $17.8 million and $10.8 million for 1958 and 1957 respectively. Chain saw shipments accounted for nearly 47 per cent of the industry's total export volume.

Tripled Plastics Use By 1970 Anticipated

The plastics industry expects to triple the use of plastics in autos in this decade, William P. Gobeille, manager of plastics operations for American Motors Corp., declared in a speech at Miami, Fla., to the Society of the Plastics Industry.

"I believe that we will reach 60 lb per average car by the end of the 1960's," Mr. Gobeille said. "While steel prices have been steadily rising, the price of plastics has been decreasing. At the same time, physical properties of plastics have been greatly improved to the point where they can be molded or formed to exact shapes with little or no waste."

Possible plastics uses in the future, he said, include hoods, wheel discs, fan blades, fuel tanks, interior window moldings, and entire seats.

New Type Jet Engine Described by GE

A new type jet engine, capable of powering military and commercial transport aircraft at speeds up to 2000 mph can be produced whenever needed, a General Electric Co. official has told Congressmen.

J. B. Montgomery, general manager of G. E.'s Flight Propulsion Div., called the engine a "fan burner" and described it as one equipped to burn fuel in the exhaust of a fan mounted directly behind the basic jet engine.

Flight and factory testing of aft-fan engines for forthcoming Convair 990 jetliners have demonstrated 40 per cent improvement in take-off thrust and 15 per cent in cruising fuel economy over straight jets, Mr. Montgomery testified. Noise levels, he added, are less objectionable because of lower exhaust gas velocities.

Hyster Introduces Improved Lift Trucks

Three engineering advances, available for the first time on Hyster lift truck models, have been introduced at the Material Handling Institute's New England Show.

The improvements include a Monotrol control system for pneumatic-tire lift trucks of 3000, 4000 and 5000 lb capacity; a three-stage upright for cushion and pneumatic-tire lift trucks of 6000, 7000 and 8000 lb capacity, and a heavy-duty oil clutch for pneumatic-tire lift trucks of 6000 through 12,000 lb capacity.

Working in combination with the power-shift Hystamatic transmission, Monotrol combines forward-reverse selection and throttle in a single, right foot pedal. This eliminates transmission control levers, allowing the operator full-time use of his hands for steering and road control.

The new three-stage upright is the first such unit available for lift trucks in the 6000-8000 lb. range. It is offered on pneumatic-tire Challenger 60, 70 and 80 models, as well as cushion-tire SpaceSaver 60, 70 and 80 units.

Demonstrating the new oil clutch was a Hyster Challenger 60 lift truck (pneumatic tires, 6000 lb capacity). The clutch will be offered as an option on models in the Challenger 60, 70 and 80 and Challenger 100-120 series.

U. S. Professor Honored

Prof. Robert Franklin Mehl of Carnegie Institute of Technology has been awarded the Institute of Metals Platinum Medal in England for his extensive work in the field of metallurgy.

SHE GOES ALONG FOR THE RIDE

Barbara Zerrien rides in back seat of driverless experimental auto in test run conducted on electronic highway at RCA Research Center, Princeton, N. J.

Boating Exports Show 493 Pct Margin

The export dollar volume of boats, engines and marine parts for 1959 exceeded imports by 493 per cent according to figures compiled by the National Association of Engine and Boat Manufacturers.

Total dollar volume of imports was $47.5 million as compared with imports totaling $9.6 million. Recreational craft shipped from this country totaled 4573. They were valued at more than $5.8 million. Inboard and outboard engine exports totaled $25 million.

AMP to Invest $6 Million in Tools

American Metal Products Co. will invest $6 million in new production facilities for truck axle housings. The new tooling and production equipment will be installed in AMP's Detroit plant and will be ready for use by mid-1961.

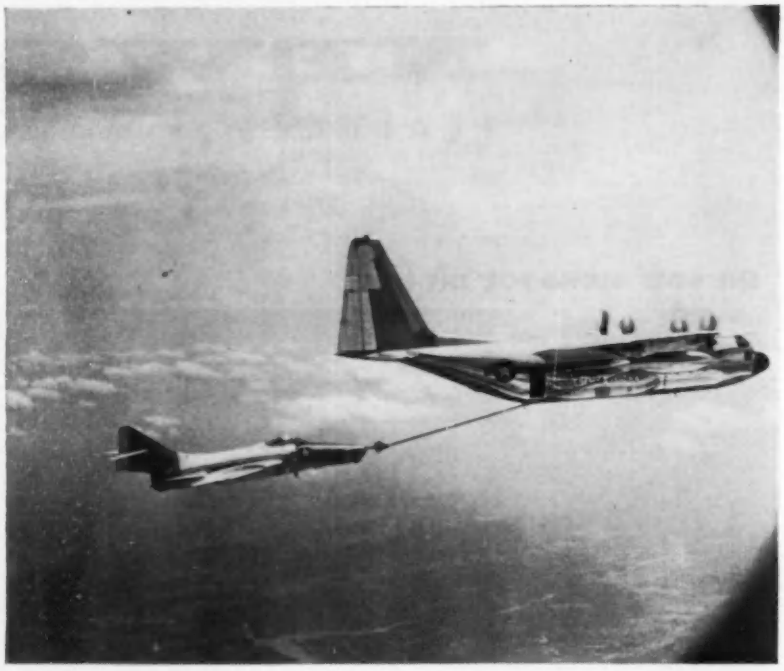
R. Jamison Williams, AMP president, says the company will be able to produce a variety of axle housings at varying production rates while gaining the benefits of volume production techniques.

Beechcraft L-23Fs Ordered by Army

The U. S. Army has ordered a substantial number of new twin-engine Beechcraft L-23F multi-purpose transports.

Powered by a 340 hp Lycoming supercharged fuel injection engine, the L-23F has a top speed of 239 mph, a service ceiling of 27,000 ft and a range of 1445 miles. It has a cargo capacity of nearly one ton.

NEW JET TANKER TESTED



Navy F9F jet (left) gets fuel cargo from Marines' new GV-1 Lockheed prop jet tanker. Paradrogues on hose are extended from pods beneath both wings to refuel two jets at same time. This is first actual hook-up of new tanker.

Automatic Devices For Machine Tools

The growing utilization of automatic devices by industry was discussed in a series of papers presented at the third annual Joint Automatic Techniques Conference. Sponsored by the American Institute of Electrical Engineers, American Society of Mechanical Engineers, and the Institute of Radio Engineers, the meeting was held recently in Cleveland. The subject matter covered employment of electronic control circuits, transistors, computers and feedback devices.

One of the papers covered machine tool applications developed by Gidding & Lewis Machine Tool Co. for the aircraft industry. Newer developments include contouring systems in difficult three-dimensional machining problems. Programming techniques have improved accuracy with wider use of a two-dimensional plotter. This device also is a great timesaver since it operates about 20 to 60 times faster than a draftsman.

Some of the latest developments in electronics sequencing for controlling metal-forming equipment were described by E. V. Crane of the E. W. Bliss Co. Noteworthy, too, is the arrangement developed for automotive press shops to produce stampings in lots where occasional changes in dies are required. One example was an 800-ton link type underdrive Bliss press with an extended bed for holding an extra die while another one is working. When dies are changed, pneumatic die clamps unlock the die in the press. It then is moved to one side, permitting the spare die to be moved into place. This operation takes a matter of minutes.

Automatic inspection and assembly devices widely employed in the automotive industry were described by Henry L. Boppel of the Sheffield Corp. He discussed high speed precision electronic gaging systems for use with air gaging or mechanical contact-type gaging systems. These promise higher speeds of detection, automatic continuous recording, selective classifying and control.

GE 'Copter System Controls Gun, Camera

A new lightweight turret system for helicopters which will permit accurate cockpit control of an externally mounted machine gun or surveillance TV camera has been displayed by the General Electric Co.

Capable of handling 150 lb loads, the remote-control system will accommodate any small machine gun up through .50 caliber to give low-speed protection against ground fire. The system also can be used to provide remote control for a conventional closed-circuit television camera or GE's new Image Orthicon TV camera for night reconnaissance.

Export Surplus Vital, Military Parley Told

American industry is dependent on importation of raw materials from abroad and a substantial export surplus is vital to the national interest if the U. S. is to achieve a favorable trade balance.

This was the message Jack L. Camp, vice president, foreign operations, International Harvester Co., gave the Sixth National Military Industrial Conference in Chicago.

Mr. Camp urged reactivation of American ingenuity in engineering, research, sales, marketing, advertising and promotion to maintain foreign sales and win the battle against imports coming into this country.

FAA Promotes Blatt

Joseph D. Blatt, acting regional manager of the Federal Aviation Agency's New York City office has been appointed deputy director of the Bureau of Facilities and Materiel.

Station Wagons Undergo Changes

When is a station wagon not a station wagon? Answer: when Automotive Conversion Corp. has altered it to fit the customized needs of a funeral director, hospital, florist, plumber, carpenter, caterer, or other specialized service.

Consider, for example, the Pontiac Safari station wagon conversion called the "Amblewagon." This unit, with the required conversion packages, can serve as ambulance, hearse, flower wagon, rescue wagon or regular passenger-carrying station wagon.

Pontiac reports a wide variety of other conversion possibilities which include refrigerator, sky roof, toilet facilities, typewriter stand, and hi-fi music.

Chrysler also has a new combination ambulance-hearse, built on the Chrysler Town and Country station wagon by Richard Brothers Div. of Allied Products Corp., Eaton Rapids, Mich.

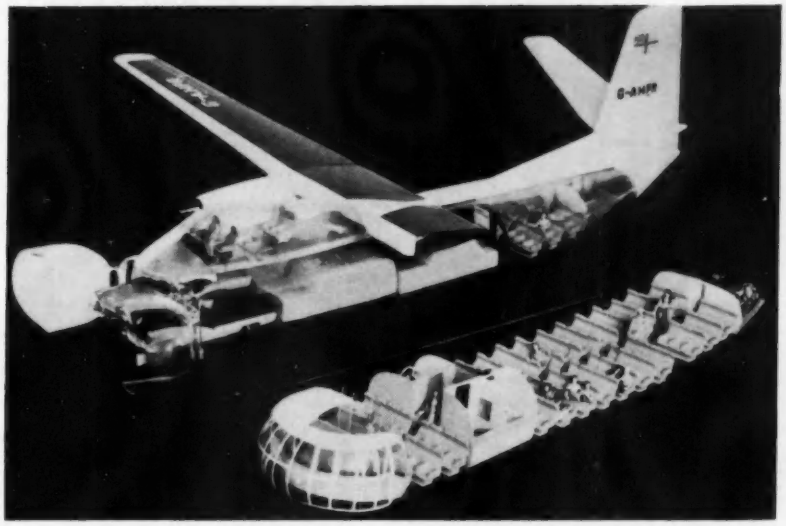
Called the Briarean, this conversion starts with a special six-in. raised roof installed at the Chrysler Jefferson plant. The Richards conversion includes full-width rear door, red lights and interior equipment.

Compact Domination By '61 Predicted

Compact cars will dominate the automotive market by the end of 1961, George Romney, president of American Motors Corp., has told the Racine, Wis., Chamber of Commerce. This is three years sooner than Romney had predicted earlier.

"I believe," Mr. Romney said "that compact cars, which now are taking about 25 per cent of the market, will be taking more than 50 per cent by the end of 1961. By the end of 1963 their share should be in the area of 65 to 70 per cent of total American sales."

ENGLISH CHANNEL FERRY?



Two versions of air ferry that will operate between England and France. Top, combined auto and passenger plane carrying six cars and 25 passengers. At bottom is 100-passenger model with observation cabin in front of fuselage.

Exide Unveils New Fuel Cell

Exide Industrial Div. of The Electric Storage Battery Co. has entered the fuel cell field aiming at near-future commercial applications.

First of all, it has come up with a new and different product approach for chemically producing electricity.

Secondly, it has made agreements with 12 industrial truck manufacturers on joint development programs.

The new type fuel cell experimentally developed by Exide uses oxygen with zinc powder. The zinc is oxidized in a potassium hydroxide electrolyte as the oxygen is admitted at about 10 psi. Still unrevealed, as being proprietary, are the positive electrode material and the nature of the catalyst used to promote the reaction.

The cells operate at ambient temperature and low pressure. There are no waste products (such as water) created. A typical unit is said to have a smaller package and a weight of about one-third that of a lead-acid battery.

For display purposes, an Exide prototype fuel cell assembly has been installed in a small car. This particular combination has 18 cells, each producing 1.5 v for a total of 27 v, rated 200 amp-hr.

Exide predicts that its cells will be capable of providing enough power to keep an industrial truck in continuous service for 16 to 24 hours before replenishing the oxygen and zinc. By charging electrically, the zinc can be restored—rather than replaced with new material.

At this comparatively early stage of development, Exide believes its zinc-oxygen cell will cost less to operate in industrial trucks than gasoline or LPG fueled units. Company officials also have in view—admittedly for the future — fuel-cell-powered automobiles and delivery trucks.

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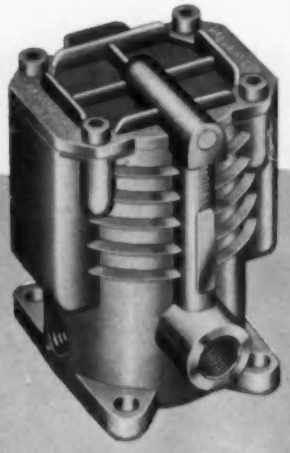
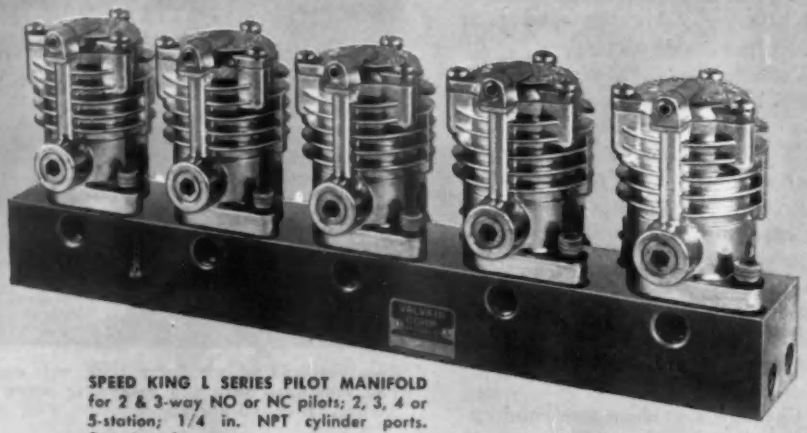
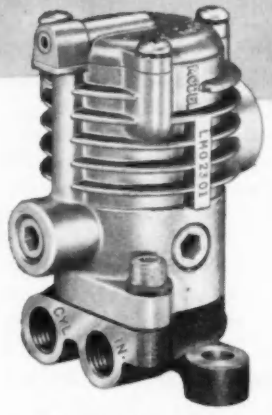
SOLENOID PILOTS



SPEED KING P SERIES PILOT 2 & 3-way NO & NC, 4-way; foot, sub-base or manifold mounting; 1/8 or 3/16 in. orifices. Foot mounting shown.



SPEED KING L SERIES PILOT MANIFOLD for 2 & 3-way NO or NC pilots; 2, 3, 4 or 5-station; 1/4 in. NPT cylinder ports. 5-station shown.



SPEED KING L SERIES PILOT 2 & 3-way NO & NC; foot, sub-base on manifold mounting; 1/16 to 1/8 in. orifices. Sub-base mounting shown.

Compact Valvair® SPEED KING pilots are ideal for control of small air or vacuum-operated devices including cylinders up to 3 in. bore, as well as for piloting larger valves. Featuring Valvair's flow-thru cooling design, they offer multi-million cycle dependability, with solenoid coils guaranteed against burn-out for the life of the valve. Choose from a full range of types, mounting styles and sizes; integral junction boxes (L Series only) and manual over-ride optional; coils for ac or dc, any voltage.

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MEN IN THE NEWS

Budd Co., Automotive Div. — Nelson R. Droulard has been named executive engineer for research and development.

Divco-Wayne Corp., Divco Div. — Fred McKaig has been appointed applications engineer.

Firestone Tire & Rubber Co.—Clarence R. Page has been named manager of trade relations department.

Hyster Ltd. — Lonay Nelson has been appointed chief engineer.

Globe-Wernicke Industries, Inc., City Machine & Tool Div. — John H. Pautz has been named general manager.

General Motors Corp., Allison Div.—William O. Watson (far left) has been named technical assistant to the Operations Manager and E. M. Deckman has been promoted to manager, sales and contracts.

Ironrite, Inc., Automotive Stamping Div.—**Max Todd** has been appointed sales engineer.

J. I. Case Co.—**Leon T. Newman** has been named treasurer.

Imperial Brass Mfg. Co., Industrial Sales Div.—**Thomas Douglas** has been appointed manager.

Metasurf Corp.—**Donald L. Miles** has been appointed vice president and sales manager.

Belden Mfg. Co. — **Herbert W. Clough,** marketing vice president, has been elected to the board of directors.

Divco-Wayne Corp. — **Noel Graubart** has been appointed credit manager.

Firestone Tire & Rubber Co.—**James E. Trainer, Jr.,** has been named factory manager of Des Moines, Iowa, plant.

Federal-Mogul-Bower Bearings, Inc., Bower Roller Bearing Div.—**Leo J. Kevitt** has been named general manager.

Peugeot, Inc.—**Ronald Krieger** has been named national service manager.

American Metal Products Co.—**David M. Diltz** has been appointed automotive sales manager.

Willys Motors, Inc.—**Thomas W. Flood** has been named special assistant to the president.

Electric Autolite Co., Special Products and Research Development Div.—**George L. Seidman** has been promoted to assistant general manager and **J. C. Carey** has been appointed hydraulic product manager.

Ford Motor Co., Ford Div.—**Paul F. Lorenz** has been appointed parts and service manager.

Studebaker-Packard Corp., Export Div.—**Charles R. Weaver** has been appointed general manager.

General Motors Corp., Oldsmobile Div.—**Emmett P. Feely** has been appointed general sales manager.

Blackhawk Mfg. Co., Automotive Div.—**Winston C. Williams** has been appointed marketing services manager in charge of lifting equipment.

Highway Trailer Co. — **Eugene A. Pelizzoni** has been appointed director of manufacturing.

Electric Storage Battery Co., Exide Industrial Div.—**Leland E. Wells** has been promoted to vice-president-engineering.

Chrysler Corp., Chrysler and Imperial Div.—**O. D. Thomas** has been promoted to eastern area sales manager; **G. J. McCarthy** has been appointed manager of dealer finance, and **J. S. Woodruff** has been named manager of distribution.

Firestone Tire & Rubber Co.—**W. F. Moore** has been named Cincinnati district manager.

Divco-Wayne Corp., **Divco Truck** Div.—**Edward Rice** has been appointed fleet sales manager.

Eaton Mfg. Co.—**Robert D. Beatty, Jr.,** has been named staff representative on special assignment.

General Motors Corp., Rochester Products Div.—**Kenneth F. Lingg** has been appointed sales manager.

Necrology

William A. Maharry, 49, public relations manager of the Lincoln-Mercury Div., Ford Motor Co., died June 4 in Detroit.

J. Alden Trovillo, director of industrial relations for the Cessna Aircraft Co., died May 22.

Orris D. Gillam, 50, former production superintendent of Chrysler Corp.'s Trenton engine plant, died May 31 at his home in Venice, Fla.

John H. Meyn, 62, vice president and chief production engineer of the Paramount Engineering Co. and former master mechanic with Chrysler Corp.'s DeSoto Div., died May 27 in Detroit.

Walter E. Wollangur died May 31 while on a fishing trip in Michigan. He formerly was Highland Park Div. manufacturing manager for Ford Motor Co. Previously, he had been plant superintendent for the Oldsmobile Div., General Motors Corp.

. . . design Creativity

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an Editorial

Scanning the Strong Points

As THE AUTOMOTIVE INDUSTRIES MOVE into the second half of their own high-level production year, it is time to review the factors which may influence the trends ahead. Most of these factors are well known. They include consumer buying interest, money, general business conditions, dealers' sales power, and credit conditions. There are also the unique factors of style appeal, the competition of other industries for the consumer's dollar, and more than any other factor, the trends of "mobility."

MID-WAY THROUGH JUNE it appeared very clearly that for the first half of the year the rate of output for passenger cars and trucks exceeded 4 million units. The first half has definitely been a surprise to the country's professional economic pessimists.

IT IS ALSO SIGNIFICANT THAT total operating rates for all industry have held at high levels. The Wharton School index illustrates this trend. It shows that all industry is moving back toward relatively high levels of capacity utilization. The depressed Steel index has distracted attention from the total industrial index. It is certainly significant that the Economic Research Department of the Chase Manhattan Bank said this month that "the excess capacity created in the 1955-'57 period is being worked off. . . . The current level of operations is comparable to that in 1955 when widespread expansion programs were launched."

AT MID-YEAR, the underlying economic position of the country is stronger than is generally recognized. The buying power of the public continues at high levels, cash flow of corporations is strong, generally earnings are very good. But most important of all, the strong financial situation exists at almost all levels throughout the country, from the Federal government down to the taxpayer. The buying appeal and possibly even "glamour" attached to new automobile ownership has restored its luster.

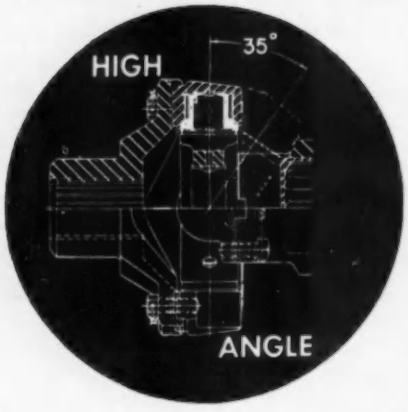
STRONGEST OF ALL THE TRENDS that influence the future of the automotive industries, is the appeal of "mobility." Few of the economic analysts quoted on the economic outlook for the industry pay much attention to this factor. If attention were paid to the factor, it would be observed that the average number of passengers per car have decreased for some time, while the population has steadily grown. By coupling this with the trend toward increased registrations, a view of the dynamics of mobility is seen. Also, the radius of action in passenger miles-per-car is increasing steadily. The trend toward "Suburbia" has increased the total miles in use, per owner, per car. The Q.E.D. of this mathematics is that more consumers have more reasons than ever before for buying more vehicles.

THESE SAME REASONS that made the sour guesses of the pessimists look pretty silly during the first and second quarters of the year, are just as valid reasons for expecting a strong second half for the industry. It is also quite encouraging to see that many of the leading financial institutions are telling their customers that "industry must take the initiative by moving ahead on far-sighted programs." The automotive industries are definitely geared into this program for progress.

Hartley W Barclay

Editor and Publisher

RIGHT SOLUTION TO A TOUGH PROBLEM



Designers with HIGH ANGULAR and LONG SLIP JOINT problems have learned to rely on MECHANICS. Where joints must run all day at constant angles up to 45°—where there are severe shock loads—where wide angles and long slip are common—and where dirt and/or moisture are continually present—MECHANICS Roller Bearing UNIVERSAL JOINTS are the accepted solution. Lifetime or once-a-season lubrication is so tightly sealed in that dirt and moisture cannot enter. If you have a "tough" joint problem and need the "right" solution, it will pay you to make use of MECHANICS engineers' wide experience in solving power transmission problems in hundreds of different fields.

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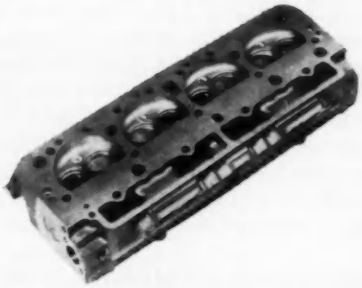
The "INSIDE STORY" OF Cadillac QUALITY



Above: In the 1960 Cadillac the example of the manufacture of the cylinder head shows how continuous improvement of quality is maintained by modern production methods typical of the entire engine.

How Cadillac manufacturing methods on engine production equal virtual aircraft engine specification refinements has been disclosed just recently in news circulated in national financial channels. The details of such quality characteristics, however, comprise a much larger story than has been previously disclosed. The graphic details of the operations on the cylinder head shown in the following pages illustrate techniques which have introduced methods typical of some other manufacturing operations on the Cadillac engine.

The description of operations by Harold G. Warner, General Manager, combines brevity with exposition adequate to provide virtually a complete as well as unique case study. Typical sequences of details of production are shown in the combinations of line drawings, photographs and a summary of condensed data on operation sheets for the complete cylinder head manufacturing sequence.

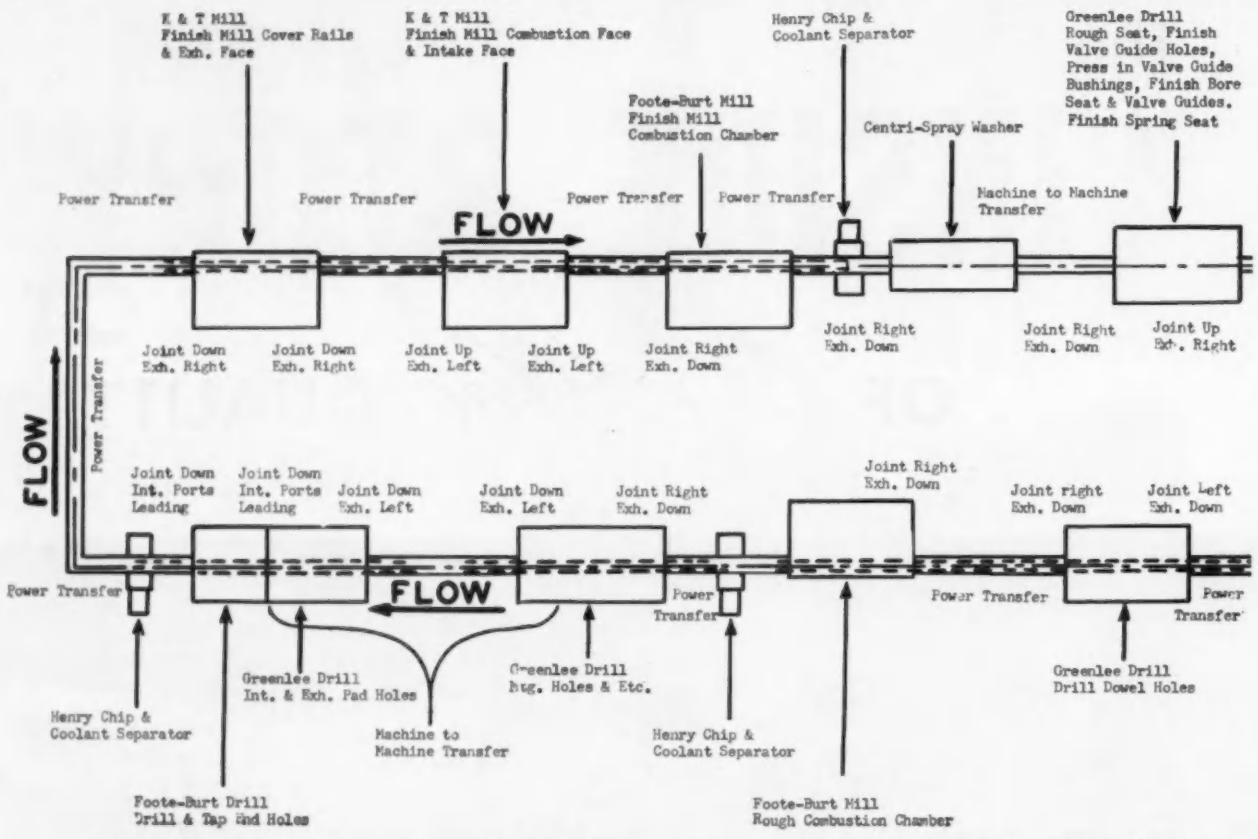


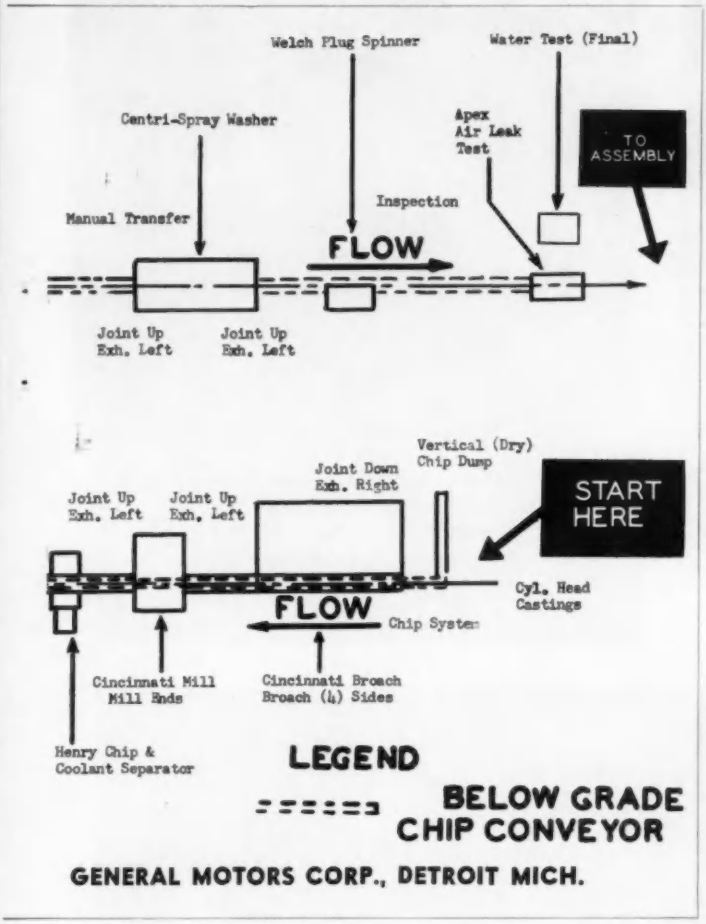
DIAGRAM OF CYLINDER HEAD MACHINING SEQUENCE AT CADILLAC MOTOR CAR DIVISION,

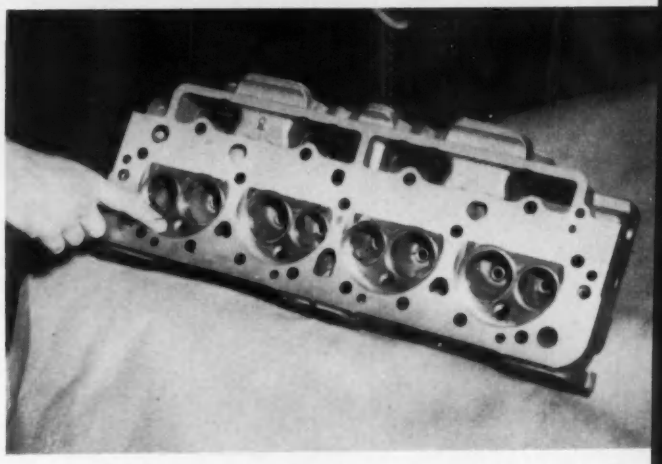
THE CYLINDER HEAD MANUFACTURING

HAROLD G. WARNER

OUR cylinder head department involved planning a closely controlled process which would give us extreme precision and a high degree of finish. With this in mind, equipment was selected on a basis of demonstrated results. The first operations are the rough and finish machining of all areas, including combustion chambers, to good commercial tolerances. The matter was not allowed to rest here, however. Another group of machines was added to precision re-machine the combustion chambers and joint surfaces. This gives us finishes, volumetric and surface accuracy beyond those normally associated with automobile manufacture.

Immediately preceding this finishing operation, the cylinder heads are put through an automatic parts washer of the latest type in order that no metal particles from previous operations can interfere with accurate locations or mar the finishes. Following the finishing operations, they are again washed, completely checked with precision air gages, and assembled. Because cleanliness is of such importance to the proper functioning of a modern high compression engine, each head assembly—after inspection—

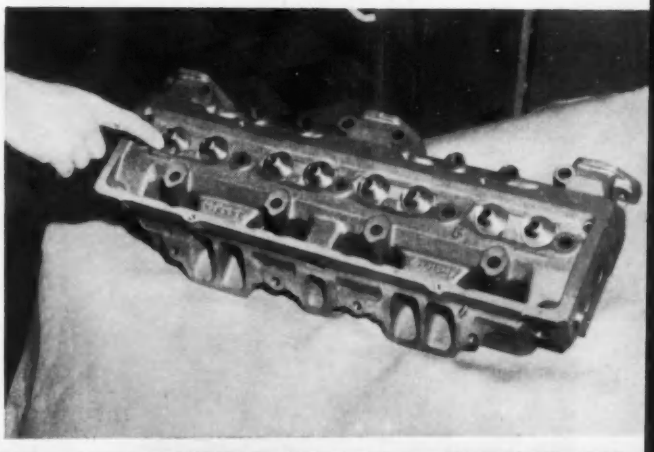




Above — Combustion chamber finish-machined cylinder head

Below—Spring seat machining in cylinder head

Bottom—Final inspection and placing of cylinder head in container for transport to engine assembly



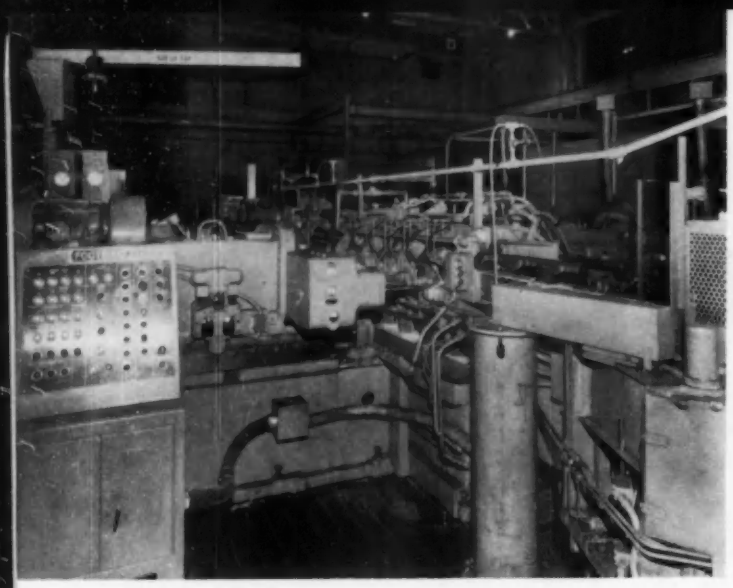
DEPARTMENT

By Harold G. Warner, General Mgr.

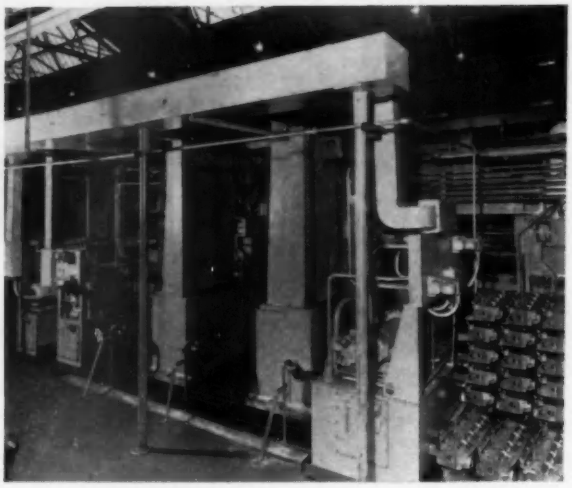
CADILLAC MOTOR CAR DIVISION
and Vice-President, General Motors Corp.

is placed in a covered container where it is not touched again until delivered to the point of assembly of the engine.

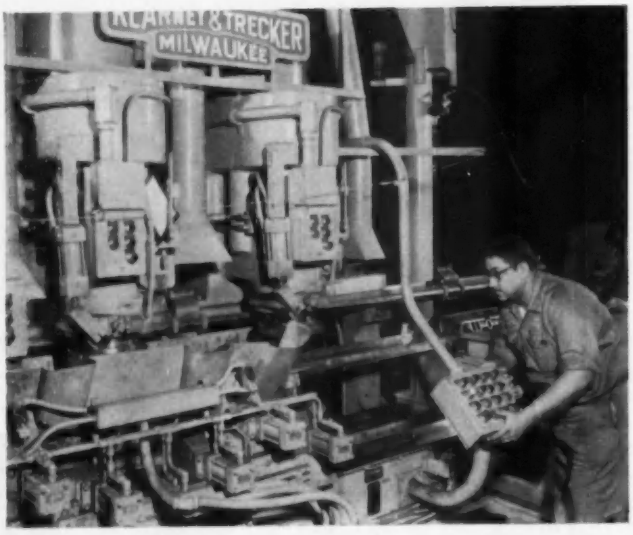
As another example of quality workmanship, the valve guide bushing inside diameter and valve seat are precision machined in the same operation to assure concentricity between the valve stem and the valve seat. This operation gives perfect sealing of both intake and exhaust valves, another step toward assured top engine performance. In this same process, the cylinder head spring seat surface is finish machined to control a precision tolerance from the valve seat to the spring seat, insuring an equal load on all valve springs. These are some of the operations which combine to make Cadillac's high compression V-8 engine the finest in the industry.



Above—This 7-station Footburt machine drills and taps all holes in both ends of the Cadillac cylinder head.

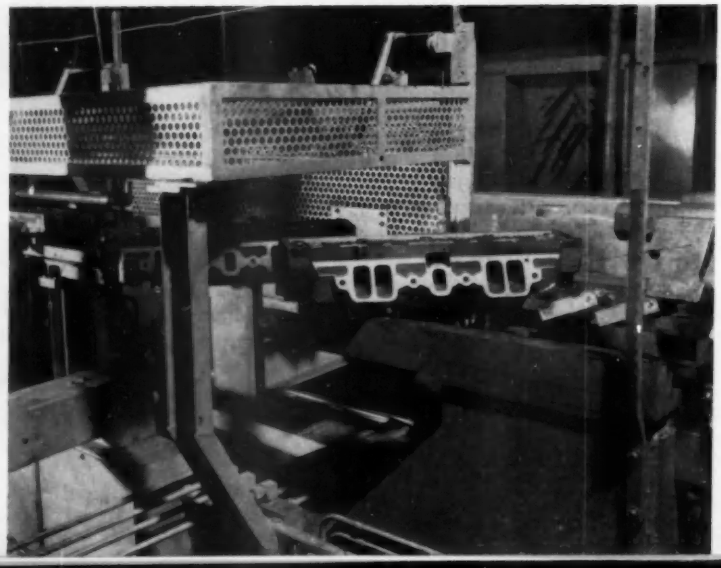


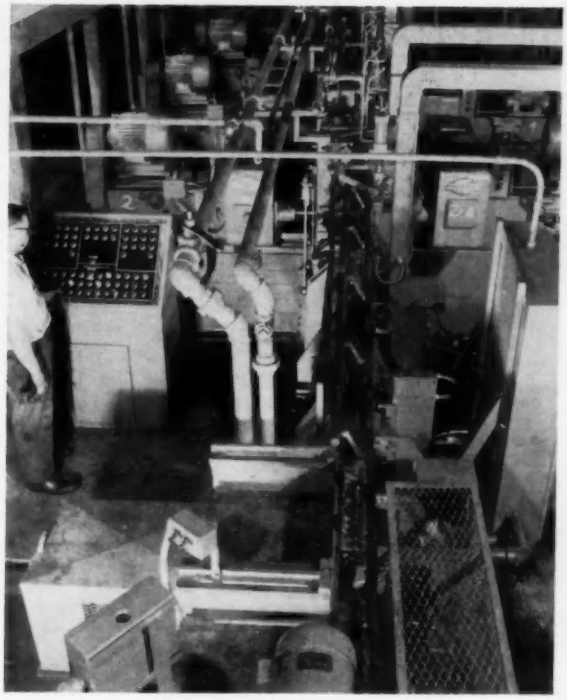
Above—Here are two working stations of the 32-station Greenlee special transfer machine. These two stations drill and tap the thermo-plug of the Cadillac cylinder head.

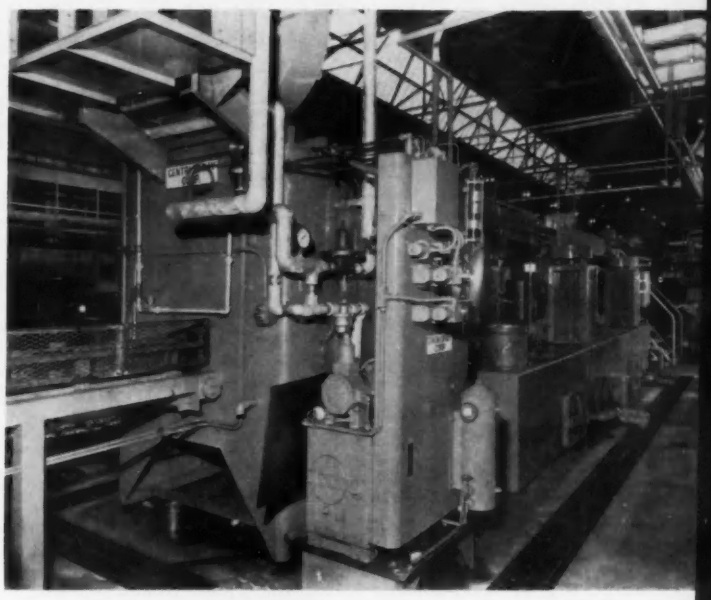


Left—Here is the load station of the 4-station Kearney and Trecker special milling machine for milling exhaust manifold mounting pads and rocker cover mounting surfaces.

Right—Here is a closeup of the automatic 90-degree index station between the Greenlee 11-station special transfer machine and the Footburt 7-station special transfer machine in Cadillac's cylinder head machining department.







At far left—This Greenlee special transfer machine drills, reams and counter-bores two dowel holes in the Cadillac cylinder head. It also drills water circulation holes and tap drills the four coverholes.

Above—This is one of two Centri-Spray cleaning machines on the Cadillac cylinder head line. Each head that goes through this unit goes through three separate stages of cleaning, two of washing and one drying. There is room for 38 heads in the machine at one time and 12 minutes is spent in the process.

Left—This over-all shot shows the Greenlee 30-station special transfer machines which drill, tap and ream all holes on the top and bottom of the Cadillac cylinder head.

Left—After the machining and cleaning processes have been completed, each Cadillac cylinder head is given a thorough final inspection before the part is sent into the engine assembly department.

SEQUENCE OF OPERATIONS ON CYLINDER HEAD

Remove Cylinder Heads from Pallet and Place on Load Conveyor.

Broach Top of Head, Bolt Bosses, Exhaust Port Pads, Joint Face and Intake Flanges.

Mill Both Ends of Head.

Transfer Heads from Cinn. Mill to Greenlee Drill.

Load (2) Heads.

Drill (4) Holes Thru in each Head. Drill (2) Holes Thru First Wall in Each Head.

C'Bore (4) Holes for Starting 3/8 Drills in Each Head.

C'Bore (4) Holes. Ream (2) in Each Head. Drill (2) 9/32 Holes Thru Tap Drill.

Ream (4) Dowel Holes Flush and Probe Tap Drilled Holes. Turn (2) Heads 180 deg and Unload.

Probe Heads for Push Rod and Tappet Clearance. Transfer from Greenlee Drill to Foote-Burt.

Rough Mill (2) Positions of Combustion Chamber.

Rough Mill (2) Other Positions of Combustion Chamber.

Semi-Finish Mill (2) Positions of Combustion Chamber.

Semi-Finish Mill (2) Other Positions of Combustion Chamber.

Rough Mill (2) Positions of Combustion Chamber.

Rough Mill (2) Other Positions of Combustion Chamber. Semi-Finish Mill (2) Positions of Combustion Chamber.

Semi-Finish Mill (2) Other Positions of Combustion Chamber.

Transfer Heads from Foote-Burt to Greenlee Drill.

Drill (17) Mounting Holes. Drill (6) Water Circulation Holes.

Tap Drill 4 Spark Plug Holes. Flush and Probe (4) Spark Plug Holes and (1) Water Circulation Hole.

Spotface, C'Bore and Chamfer (4) Spark Plug Holes. C' Bore Combustion Chamber Side.

Ream and Chamfer Spark Plug Holes. Drill Water Circulation Hole.

Tap Spark Plug Holes. Tap Rocker Cover Holes. Press in Dowel Pin Pt. in Hole.

Tilt Part 17 deg to Present Valve Holes to Horizontal Heads.

Drill Valve Guide Bushing Holes. C'Bore Intake Valve Seat Throat Holes.

C'Bore Exhaust Valve Seat Throat Holes.

Dump Chips and Turn Part 107 deg.

Drill, Chamfer, and Tap (6) Exhaust Face Holes, Drill, Chamfer, and Tap (4) Intake Face Holes, Drill and Ream (1) Locating Hole.

Rotate Parts 180 deg and Unload.

Drill & Tap All Holes in End of Cylinder Head, also Welch Plug Holes.

Transfer Heads Across End of Line.

Transfer and Position Heads to K & T Mill.

Load (2) Heads.

Finish Mill Cover Rail Face of (2) Heads at One Time.

Finish Mill Exhaust Pad Face of (2) Heads at One Time. Unload Parts.

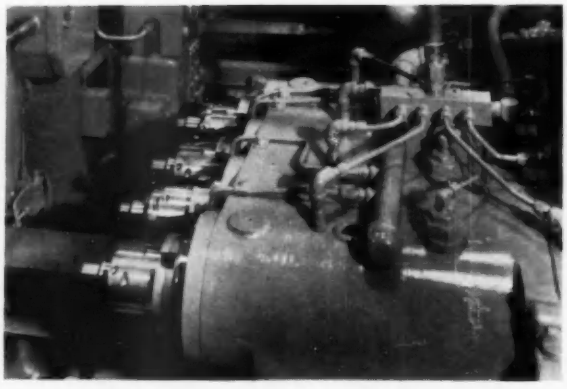
Transfer Heads From K & T Mill to K. & T. Mill.

Finish Mill Gasket Face and Intake Manifold Pads.

Load (2) Heads, One At a Time.

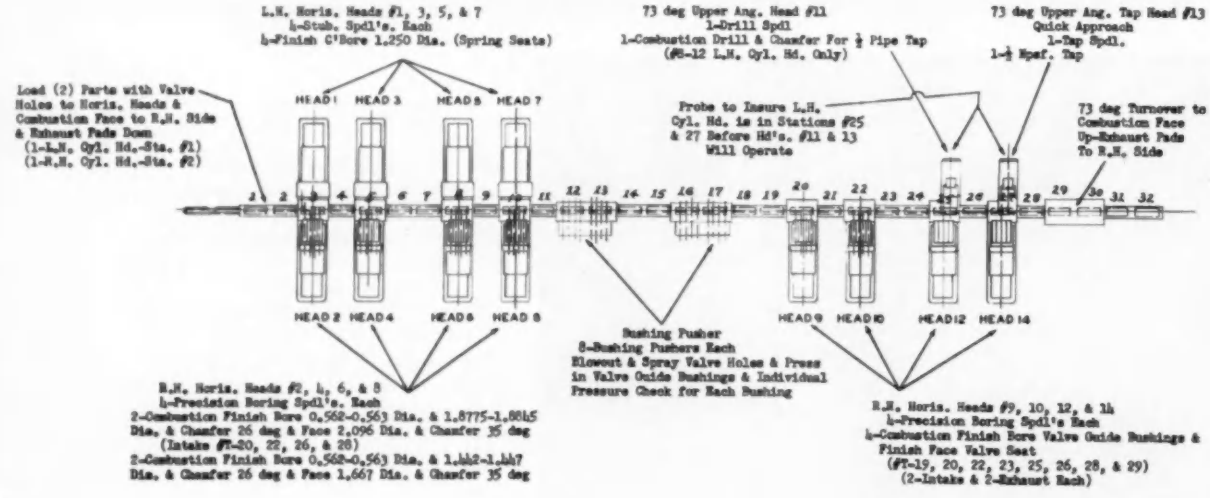
Finish Mill Gasket or Combustion Chamber Face of (2) Heads at One Time.

Right—Close-up of the 4-spindle gun boring head that performs valve seating and valve guide hole operation on Cadillac cylinder head.



Below—Diagram of the 32-Station Greenlee automatic transfer machine that performs gun boring operations on the valve guide holes and the valve guide bushing holes. This machine completes 50 operations on the Cylinder Head with the machining cycle at 140 pieces per hour at 80 per cent efficiency. A bushing press in this machine was expressly designed to push in each valve guide bushing individually. This permitted the installation of minimum and maximum pressure gages in each hydraulic circuit to insure that each bushing that was pushed into the valve guide holes was inserted within the specified pressure limits.

DIAGRAM OF 32-STATION GREENLEE AUTOMATIC TRANSFER MACHINE FOR GUN-BORING


L.H. Horiz. Heads #1, 3, 5, & 7
4-Stub. Spdl's. Each
4-Finish C'Bore 1.250 Dia. (Spring Seats)
73 deg Upper Ang. Head #11
1-Drill Spdl
1-Combustion Drill & Chamfer For 1/4 Pipe Tap
(#8-12 L.H. Cyl. Hd. Only)
73 deg Upper Ang. Tap Head #13
Quick Approach
1-Tap Spdl.
1-1/4 Mpsf. Tap
Load (2) Parts with Valve Holes to Horiz. Heads & Combustion Face to R.H. Side & Exhaust Pads Down
(1-L.H. Cyl. Hd.-Sta. #1)
(1-R.H. Cyl. Hd.-Sta. #2)
Probe to Insure L.H. Cyl. Hd. is in Stations #25 & 27 Before Hd's. #11 & 13 Will Operate
73 deg Turnover to Combustion Face Up-Exhaust Pads To R.H. Side
HEAD 1
HEAD 3
HEAD 5
HEAD 7
HEAD 2
HEAD 4
HEAD 6
HEAD 8
HEAD 9
HEAD 10
HEAD 12
HEAD 14
Bushing Pusher
8-Bushing Pushers Each
Blowout & Spray Valve Holes & Press in Valve Guide Bushings & Individual Pressure Check for Each Bushing
R.H. Horiz. Heads #2, 4, 6, & 8
4-Precision Boring Spdl's. Each
2-Combustion Finish Bore 0.562-0.563 Dia. & 1.8775-1.8815 Dia. & Chamfer 26 deg & Face 2.096 Dia. & Chamfer 35 deg
(Intake #T-20, 22, 26, & 28)
2-Combustion Finish Bore 0.562-0.563 Dia. & 1.4482-1.4487 Dia. & Chamfer 26 deg & Face 1.667 Dia. & Chamfer 35 deg
R.H. Horiz. Heads #9, 10, 12, & 14
4-Precision Boring Spdl's Each
4-Combustion Finish Bore Valve Guide Bushings & Finish Face Valve Seat
(#T-19, 20, 22, 23, 25, 26, 28, & 29)
(2-Intake & 2-Exhaust Each)

Finish Mill Intake Manifold Face of (2) Heads at One Time.

Unload.

Transfer Heads from K & T Mill to Footeburt Mill.

Load (2) Cylinder Heads.

Finish Mill (2) Positions of Combustion Chamber.

Finish Mill (2) Other Positions of Combustion Chamber.

Unload (2) Cylinder Heads. Transfer Heads from Foote-Burt Mill to Centri-Spray Washer.

Wash Cylinder Heads.

Transfer Heads from Washer to Greenlee Machine.

Load (2) Heads.

Finish Valve Guide Bushing Holes, Finish C'Bore Above Valve Seat, and Finish Valve Throat Hole Below Valve Seat.

Finish C'Bore Spring Seats.

Finish C'Bore (4) Spring Seats.

Compress Valve Springs and Assemble Keys.

Remove Assembly Plate, Clean Joint Face, Leak Test Seals, and Hang on Conveyor.

Blowout and Spray Valve Holes, Press in Valve Guide Bushing, and Pressure Check for each Bushing in each Head.

Finish Bore Valve Guide Bushings and Finish Valve Seat Intake and T-23 and T-29 Exhaust. Tap Drill and Chamfer Thermo Plug Hole in LH Head Only.

Rotate Heads 73 deg.

Unload (2 Heads) and Inspect.

Rotate to Remove Coolant.

Press Welch Plugs in Both Ends of Head and Assemble Dowel in Intake Face.

Inspect Complete Including Concentricity of Valve Seats.

Recheck Valve Seats and Undersize Valve Guide Holes.

Press in O.S. Valve Guide Bushing.

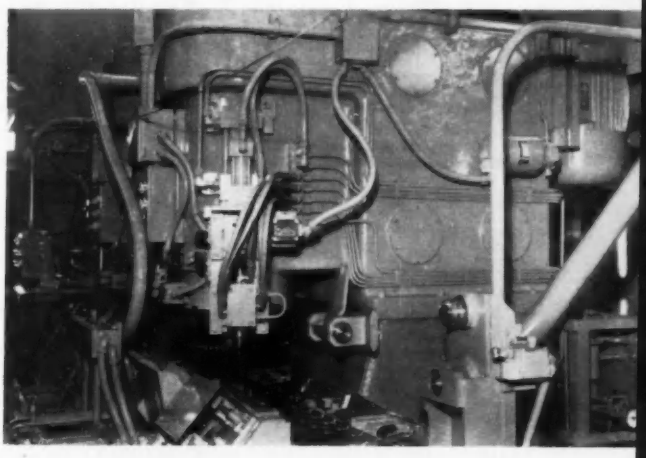
Water Test.

Assemble 1/8 Pipe Plug in Both L and R Hand Heads.

Dip Valves—Insert Valves (Intake—EXH) In Head and Place Head on Retaining Plate.

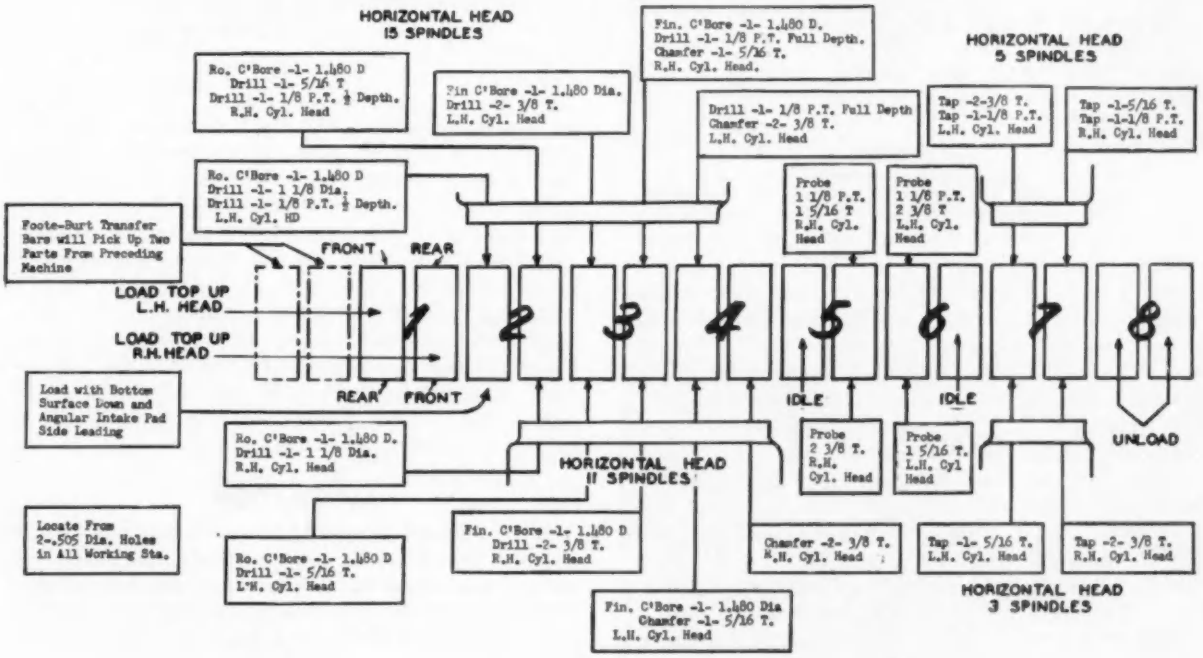
Assemble Seals, Valve Springs and Valve Seats.

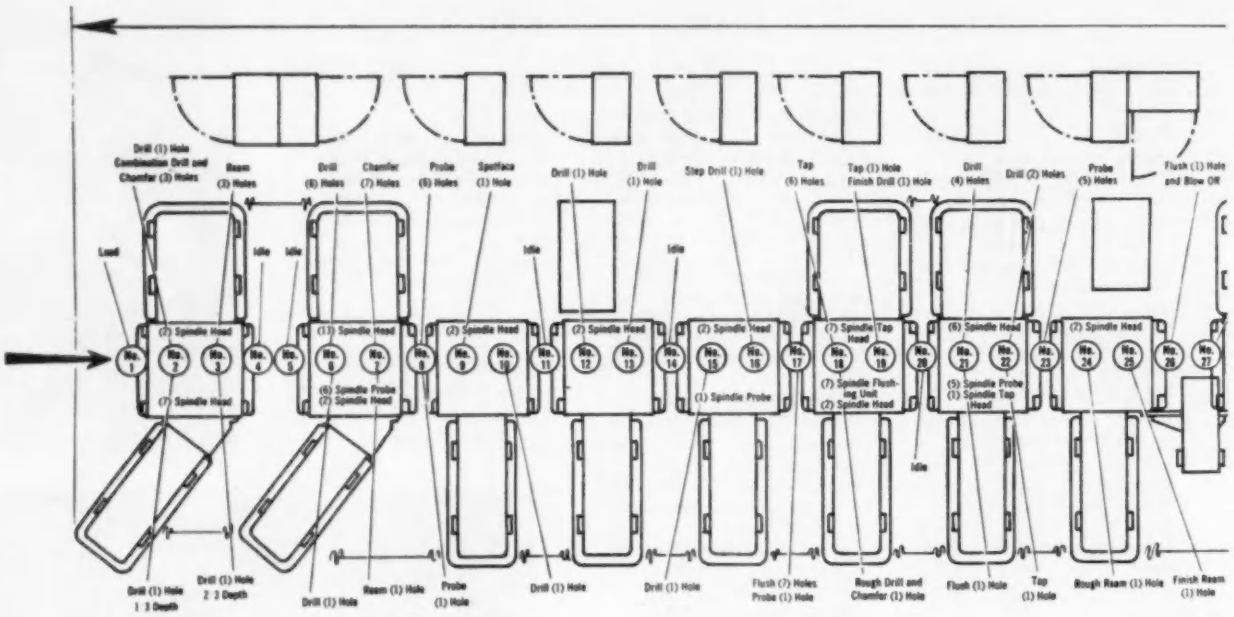
Right — Close-up view of milling cutters used to mill combustion chamber.



Right: Perhaps the most important feature of the K & T machine is illustrated here. The unit shown is used to limit the stock removal of the combustion chamber face operation to a constant depth for any particular workpiece. Starting with the quill in a fully retracted position and the workpiece clamped, the quill is extended until the stylus contacts the rough milled surface of the combustion chamber face. The quill is then further extended to position the cutter for a constant 0.015 in. depth of cut. With this mechanism, it is possible to hold the combustion chamber volume within a relatively close tolerance.

DIAGRAM OF EIGHT-STATION 34 SPINDLE FOOT-BURT DRILLING AND TAPPING MACHINE


HORIZONTAL HEAD 15 SPINDLES
Ro. C'Bore -1- 1.480 D Drill -1- 5/16 T. Drill -1- 1/8 P.T. ½ Depth. R.H. Cyl. Head
Fin C'Bore -1- 1.480 Dia. Drill -2- 3/8 T. L.H. Cyl. Head
Ro. C'Bore -1- 1.480 D Drill -1- 1 1/8 Dia. Drill -1- 1/8 P.T. ½ Depth. L.H. Cyl. HD
Foote-Burt Transfer Bars will Pick Up Two Parts From Preceding Machine
FRONT
REAR
LOAD TOP UP L.H. HEAD
LOAD TOP UP R.H. HEAD
Load with Bottom Surface Down and Angular Intake Pad Side Leading
REAR
FRONT
Ro. C'Bore -1- 1.480 D. Drill -1- 1 1/8 Dia. R.H. Cyl. Head
Locate From 2-.505 Dia. Holes in All Working Sta.
Ro. C'Bore -1- 1.480 D Drill -1- 5/16 T. L.H. Cyl. Head
HORIZONTAL HEAD 11 SPINDLES
Fin. C'Bore -1- 1.480 D Drill -2- 3/8 T. R.H. Cyl. Head
Fin. C'Bore -1- 1.480 Dia Chamfer -1- 5/16 T. L.H. Cyl. Head
Fin. C'Bore -1- 1.480 D. Drill -1- 1/8 P.T. Full Depth. Chamfer -1- 5/16 T. R.H. Cyl. Head.
Drill -1- 1/8 P.T. Full Depth Chamfer -2- 3/8 T. L.H. Cyl. Head
Probe 1 1/8 P.T. 1 5/16 T R.H. Cyl. Head
Probe 2 3/8 T. R.H. Cyl. Head
Chamfer -2- 3/8 T. R.H. Cyl. Head
IDLE
Probe 1 1/8 P.T. 2 3/8 T L.H. Cyl. Head
Probe 1 5/16 T. L.H. Cyl Head
IDLE
HORIZONTAL HEAD 5 SPINDLES
Tap -2-3/8 T. Tap -1-1/8 P.T. L.H. Cyl. Head
Tap -1-5/16 T. Tap -1-1/8 P.T. R.H. Cyl. Head
Tap -1- 5/16 T. L.H. Cyl. Head
Tap -2- 3/8 T. R.H. Cyl. Head
HORIZONTAL HEAD 3 SPINDLES
UNLOAD
1
2
3
4
5
6
7
8



Trends in Special Purpose Machine Tools

By Howard N. Maynard
President, SNYDER CORP.
DETROIT, MICH.

THE Machine Tool Exposition—1960, to be held in Chicago, September 6 to 16, will highlight a wide variety of special purpose machines designed to perform a multiple of operations in specialized sequences, utilizing many automation principles. Since the last Machine Tool Exposition in 1955 there have been a great many changes made in the general metalworking plant requirements for special machines.

ALUMINUM

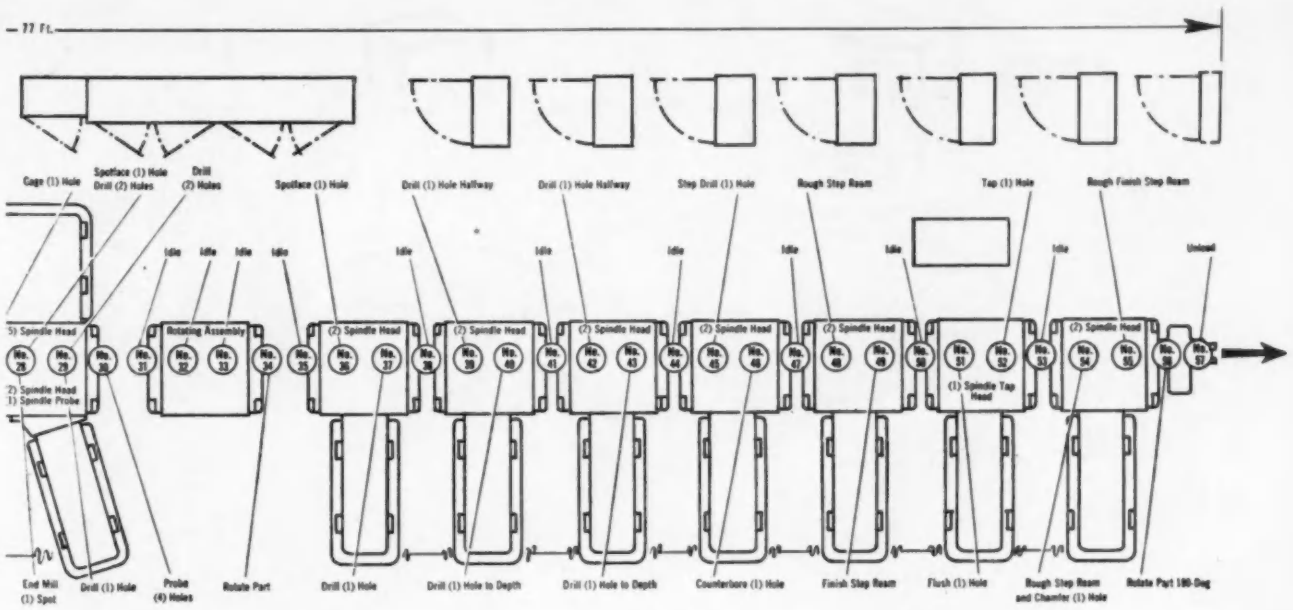
One of the most significant trends is the one being made to higher speeds as a result of the machining of increased numbers of parts made of aluminum. One of the interesting problems that many special machine tool builders have had to cope with is the provision of equipment that will handle either cast iron or aluminum parts. This means that a considerable amount of initial flexibility has to be built into the machine to permit simple, easy changes in speeds and feeds.

In addition to the trend toward aluminum parts, industry is consistently asking for higher speeds and feeds on special machines processing cast iron and steel parts. As a result you will find that the machine tools in the 1960 Exposition have much higher horsepower drives and better tool designs that permit the higher feeds and speeds and resist shock loads.

Another interesting trend in processing procedures on special machines is the one towards starting a sequence with a rough part rather than one that has been preconditioned with milled surfaces or reamed dowel locators on another machine. To accomplish this requires the design and development of equalizing-stock type fixtures that will enable the machine to remove uniform stock from all over the part while retaining basic dimensional relationships with surfaces and passages that are not machined. Many of these fixtures are marvels of tool engineering design. They are understandably costly, but well worth their outlay in the savings that are made by eliminating a part preconditioning operation.

AUTOMATION

We have seen more and more emphasis placed in the past year or so on the completely automated special machine concept. In particular, the interest has been to include fully automatic loading, transferring, and unloading devices on a machine to maintain a



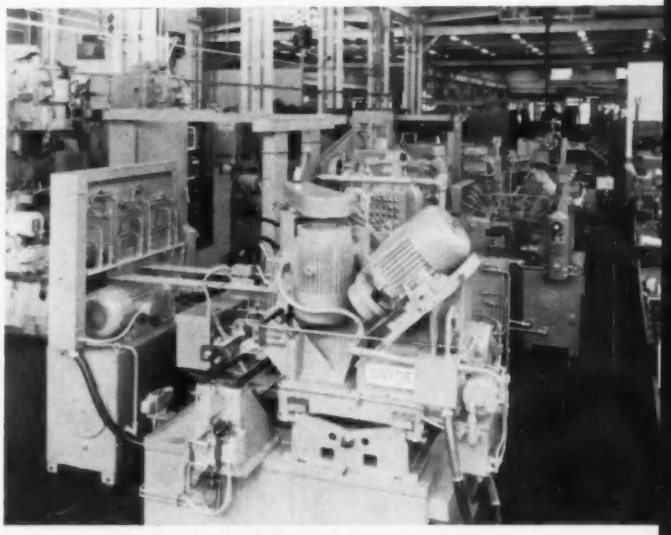
Above: A line drawing of a new Snyder transfer line. It shows all of the segments, operations and head units used in a machine that produces 180 automobile automatic transmission oil pump bodies per hour at 100 per cent efficiency.

consistent, high level of production of parts of maximum accuracy. Such devices avoid part damage due to careless manual handling.

Flexibility of special machines is a subject that has always been a point of major emphasis by the user. Since the last Exposition many changes have been made in the basic special machine concepts that do increase flexibility. Segmented designs of transfer lines, building block machine construction and extra spacing between stations of all types of special machines effectively add to their flexibility.

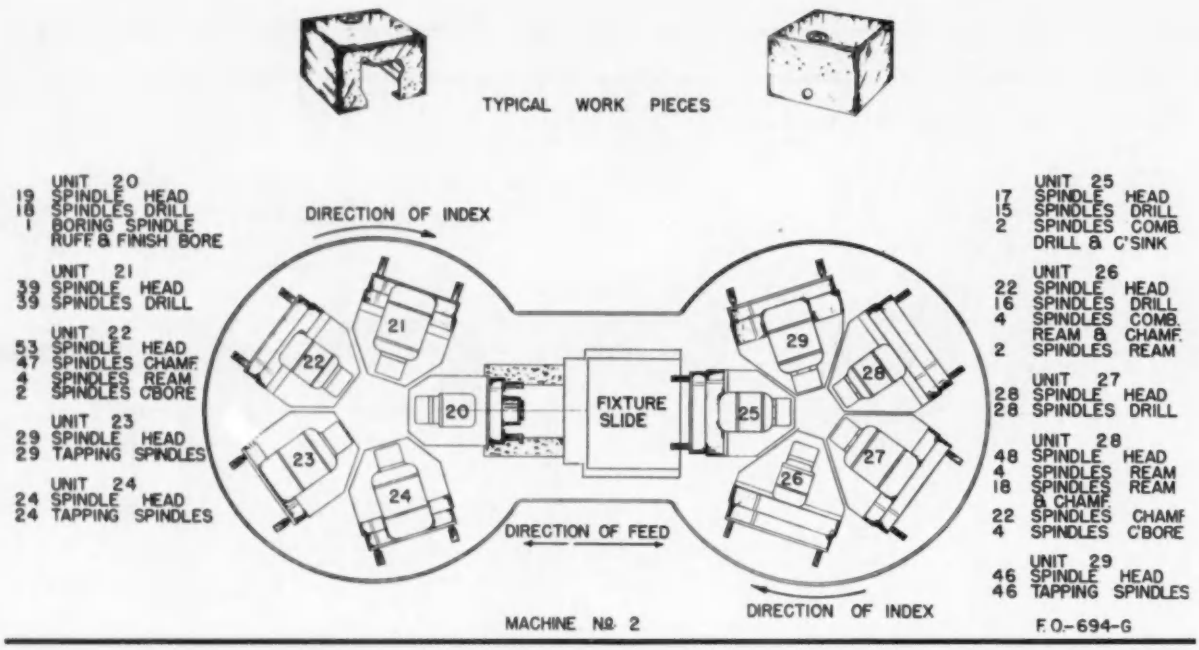
CONTROL SYSTEMS

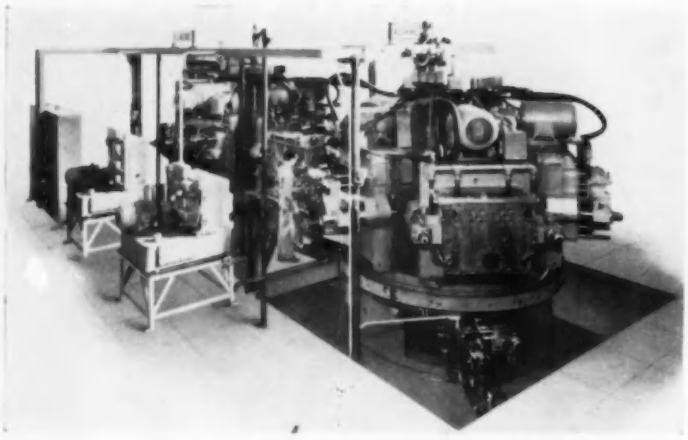
Servicing of electrical and hydraulic control systems for special machines is a problem that is continually being studied and evaluated by machine tool builders. These factors plus those involved with troubleshooting have been met with new approaches. Today a user of special machines likes to have a full indication of cycle status at all times. This has meant that pushbutton control panels are seen all along the transfer line. There are cycle indications in a master panel at the start end of the machine and there are panels indicating operation condition for every machining segment along the line. *(Continued)*



Above: This Snyder transfer machine mills cover face, exhaust bosses, construction bosses, intake face and joint face on an aluminum automotive cylinder head. This machine includes a rotating fixture that reorients the part when it is half-way through the machine. Production rate is 120 cylinder heads per hour at 100 per cent efficiency.

Right: Twenty-four station Ex-Cell-O transfer machine for multi-diameter precision boring, facing and chamfering, milling, tapping and gaging. Component is automobile transmission case.





Above: Schematic drawing of W. F. and John Barnes special turret-type machine with (2) 5-station rotary tables, one at each end and shuttle type holding fixture. Used for making off-highway equipment parts consisting of welded steel cases fully machined at the rate of 2.90 per hour. Tables are each 96 in. in diameter and are provided with a power operated index and index locating pin. Left: View of machine seen from right end. Machine base is in three sections. Bases are arranged so that coolant and chips will flow into chip conveyor and carry to the side to a coolant tank in the floor. All electrical controls are built according to J.I.C. standards and machine is equipped with Barnes Electro-Graphic detector panel which reduces down-time that may be caused by any electrical malfunction. Machine is designed with stationary-type heads and only three hydraulic units are required for the entire machine.

PANELS AND INDICATORS

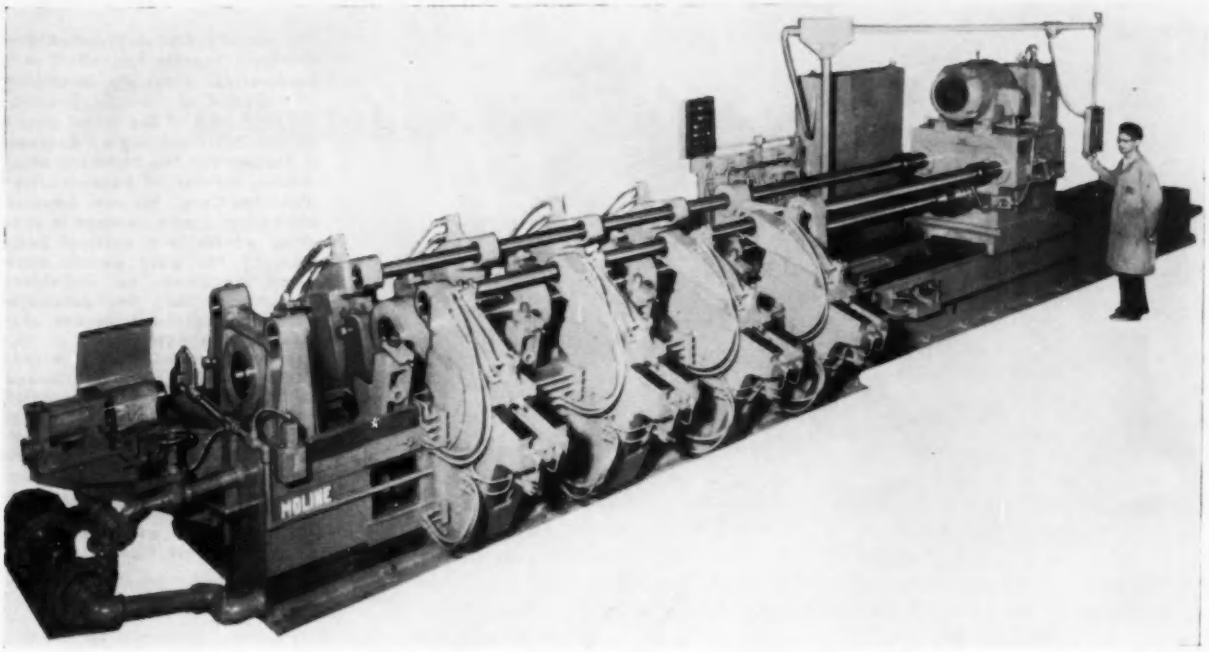
There will be many more pushbutton panels and indicator lights on machine tools, but they have proved their worth in the ability that they provide to shoot trouble quickly. A few years ago the inside of an electrical control panel was a complicated maze of wiring and relays that only a few graduate electrical engineers could tackle with know-how. Today's panels include many troubleshooting aids that enable factory maintenance technicians to spot trouble and put a machine back in operation quickly.

A few years ago we thought that we had exploited to the fullest the number of machining operations that could be carried out on transfer machines and other types of special machine tools such as center-column types, rotary index machines and trunnion type machines. The machines that are being delivered today show that we had nowhere near reached the maximum of what could be carried out in a given work space or floor area. This is, of course, one of the advantages that special machines offer; the tailored development of a specialized production unit that squeezes the most out of a given work space. The desire by industry to work more and more operations into one machine has spurred this compaction endeavor. More than one special machine at the Exposition will include automatic assembly as a part of the processing sequence.

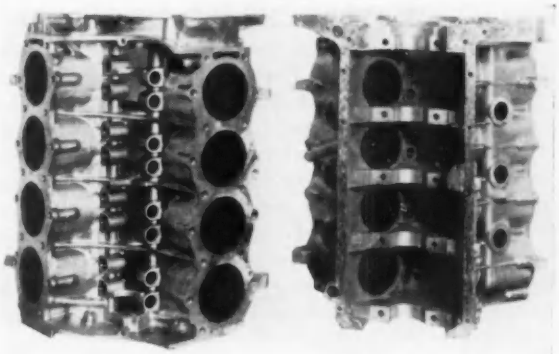
IN-PROCESS GAGING

Of course, when you squeeze more and more operations into an automatic sequence, you have to be careful or you will have created a monster that will make scrap at frightfully high rates. In-process gaging is the technique that prevents such a catastrophe from occurring.

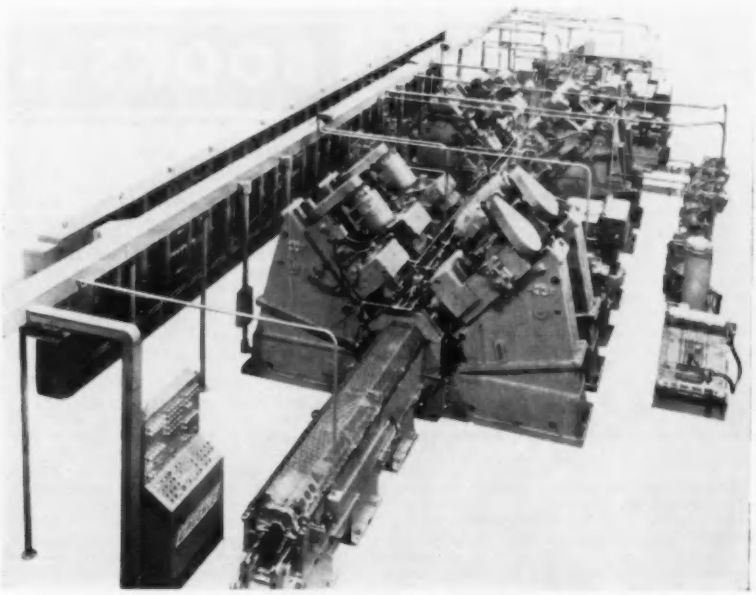
It is really not enough to just check the parts at certain key points along the machine to make certain



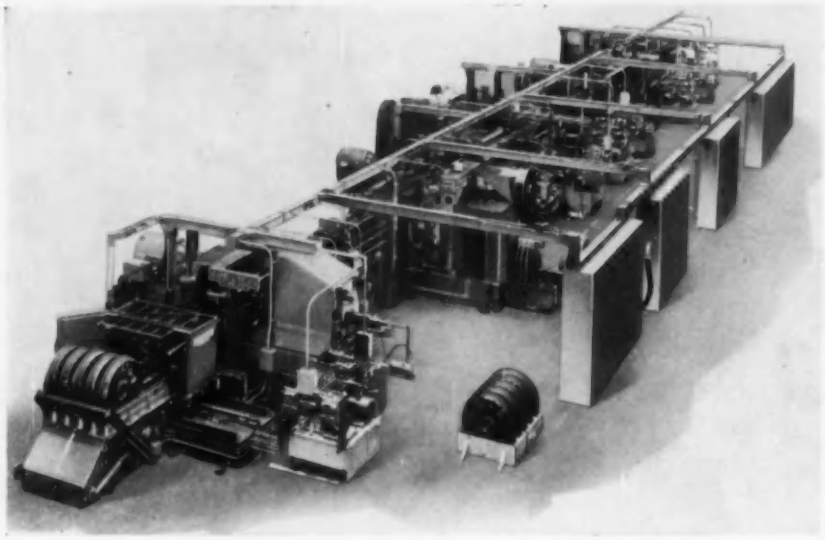
Above: Model MR147 Moline Tool Co. horizontal, hydraulic feed boring machine for 12-cylinder and 16-cylinder V-type locomotive Diesel engine blocks. Three boring bars, powered by a single drive head unit are traversed 16 ft to working position and have 21 in. of feed travel. The lower bar machines the crank bores which are approximately 9 in. in diameter, and faces both sides of the center main bearing. Two smaller bars bore the cam lines. Hydraulic powered retracting boring bar supports provide clearance for loading the fixture and give rigid support to cam bars in working position. Overall length of machine is approximately 43 ft.



Center, right: This aluminum V-8 cylinder block was processed on an 18-station transfer machine manufactured by Greenlee Bros. & Co., Rockford, Ill. Gun-boring of the valve lifter holes was done for the first time on this machine. The view on the left shows 16 valve lifter holes which were gun-bored to ± 0.0005 dia. The pan rail view on the right shows some of the 43 holes that were drilled and tapped in the block.



Lower, right: A battery of way-type, gun boring spindles bores valve lifter holes. Cylinder blocks are processed through this 75 ft. machine. Multiple drilling and tapping operations are performed in pan rail, top and cylinder banks of the blocks. Rollover stations, blow-out and flush and inspection probes complete the operations performed on this Greenlee machine.



The world's first automated five machine transfer line which will perform the complete machining of railroad car wheels, producing at a rate of one wheel every 90 seconds. Designed by Kearney & Trecker for the Standard Steel Works, division of Baldwin-Lima-Hamilton Corp., the new machine introduces a new concept in handling wheels in a vertical position. In the past wheels have been machined on individual tools. Now they are automatically transferred from one station to the next. Each of the five machines is actually a separate machine tool, interlocked with load, unload and inspection stations operating as one machine which performs the following operations: (1) Loading, (2) rough boring, (3 and 4) facing, (5 and 6) turning, (7) inspection and (8) unloading. It is 118 ft long, 30 ft wide and seven feet high.

that everything is going O.K. You must also check the condition of the tooling that is machining the part to make certain that it is not broken or worn to a point where part damage will result. There was not a great deal of such in-process gaging and tool condition indicating equipment included on machines at the last Exposition. There will, however, be much of it on display at The Machine Tool Exposition—1960. If one is drilling and tapping on a special machine in a sequence today, he will always include probing and automatic shutdown devices to check for broken tools. When a critical operation such as thread rolling is carried out in an O.D. turning and threading sequence, it makes good sense to check the O.D. before threading to make certain that the proper amount of material is present for the rolling process. Even precision electronic and air gaging devices are now being included on special machine tools today.

ANALYZE COSTS

We have all seen companies go out of business recently because they had not kept up with the special machine-automation trend of the past decade. Just to maintain a competitive product cost today in the face of rising labor and material costs means that every automation concept has to be continually evaluated and certain new equipment installed on a regular basis.

Attendance at The Machine Tool Exposition in Chicago in September is one sure way that a company can use to see the latest developments in cost-saving special machine tools. ■

BOOKS . . .

RADIOISOTOPES, A NEW TOOL FOR INDUSTRY, *by Sidney Jefferson, published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price, $4.75.* This book seeks to give the businessman and layman an insight into the many and varied ways in which industry has benefitted, and can benefit in the future, from the use of radioactive materials.

PETROLEUM PRODUCTS HANDBOOK, *prepared by a staff of specialists and edited by Virgil B. Guthrie. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $18.50.* Here is a master reference of methods, information and data to help more effectively supply or use virtually any type of petroleum product. It offers quick, reliable answers to practical questions on every aspect of product use.

AUTOMATION AND SOCIETY, *by Howard Boone Jacobson and Joseph S. Roucek, published by Philisophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price, $10.00.* This is a non-technical current history to one of the most challenging development in modern industrial society. The editors present the considered conclusions of 32 experts who have examined the present and potential impact of automation on the many facets of our society.

ELEMENTRY ANALYSIS: A MODERN APPROACH, *by H. C. Trimble and F. W. Lott, Jr., published by Prentice-Hall, Inc., 70 Fifth Ave., New York City. Price, $6.95.* This book is a result of revision of the pre-calculus course at Iowa State Teachers College. The authors have found that only a minority of college freshmen, even those who studied algebra, geometry, and trigometry in high school, are ready to begin the study of calculus. The book has been planned to prepare entering freshmen for a course in calculus.

INDUSTRIAL ELECTRONICS CIRCUITS, *by R. Kretzmann, published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price, $10.00.* This book, a sequel to Industrial Electronics Handbook, deals with circuitry of industrial electronic apparatus, and includes nearly 200 carefully chosen circuits. Functions of the various circuit elements are described and comprehensive information is supplied on the actual component values.

FUNDAMENTALS OF GUIDED MISSILES, *by Air Training Command, U. S. Air Force, published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. Price, $12.50.* A masterful job of organizing into one volume the fundamentals of the entire field of guided missiles has been done in this book. It covers areodynamics, propulsion, instrumentation, electronic controls and guidance systems. The publisher's technical staff has added a glossary of "Guided Missile Terms" which are defined.

ELSEVIER'S AUTOMOBILE DICTIONARY, *by Ing. G. Schurmans Stekhoven, published by Elsevier Publishing Co., New York City.* Translators, researchers, engineers, dealers and technicians with an interest in the automobile industry will welcome this eight-language reference work which facilitates precise communication in many languages.

FUNDAMENTALS OF ELECTRICITY, *by Calvin C. Bishop, published by Chilton Co., 56th and Chestnut Sts, Philadelphia 39, Pa. Price, $6.95.* Reviewing early discoveries and latest inventions, this book will be of value to students of electricity in schools of institute grade, to college men and to technicians, whose daily work requires a knowledge of circuits and apparatus.

SPI Automotive Conference

Merits of Plastic Foams Reviewed By Suppliers and Automotive Stylists

By Norman M. Lloyd
MARKETS EDITOR

CURRENT and potential applications for cellular plastic foams were thoroughly explored at the Automotive Conference of the Society of the Plastics Industry in Detroit. Held at the Statler Hilton on the afternoon of June 1, the meeting was attended by an enthusiastic group of over 300 top executives, engineers and technical sales personnel representing the automotive manufacturers, material suppliers and fabricators.

Five technical papers were presented by a team of vehicle styling specialists and cellular plastic manufacturers dealing with the industry's experience in the development and use of "foamed plastics" for such items as topper pads, sun visors, head liners, arm rests and dash safety padding. Emphasis was placed on the unique and versatile properties of vinyl, urethane and polystyrene foam and their advantages over other materials.

Significant advances in cellular chemistry, production techniques and cost control were pointed up as agents responsible for potential applications that would encompass a record number of parts and components in the area of automotive comfort, safety and styling. Recommendations were made, however, to use foams within the limitations of their performance and not to extend their qualities to requirements best satisfied by other materials.

The conference was highly successful in giving a better understanding of this material class and how it can be used, without becoming unduly involved in theoretical considerations.

Following are abstracts from selected papers.

Plastic Foam—Your Key to Better Styling

By James W. Hull
President
HULL DEVELOPMENT CO.

The predominant type of foam used has been the polyurethanes with lesser amounts of vinyl, polystyrene and polyethylene. There are other types of plastic foams, but they have not been used in automobiles. These foams are in use by all transportation manufacturers. Automobile volume today is approximately 40 million lb per year and is continuing to grow.

Plastic foam can lighten weight, lower the roof line and decrease the silhouette. It can also help to lower costs without sacrificing attractiveness, functionality or strength. Indeed, it most often increases strength. These factors are even more important today because of the growing importance of the compacts. All of the ideas presented here are considered practical and can be realized within the near future.

The following potential applications can be divided into three broad categories. They are: (a) interior, (b) exterior and (c) under the hood.

The largest single use for foam is seating. The plastics industry has two excellent condidates for this application. They are the polyether urethanes and vinyl.

Special chemistry to overcome the tendency to stiffen when cold will increase the potential of vinyl foams. The present market, however, points to an increasing interest in skin-vinyl construction.

Urethane foams have many interesting possibilities. Since urethane has excellent adhesion to metal, superb tear strength and high tensile strength, it can do things that could never be done with conventional foam.

Full depth cushioning is now a possibility. Envision a seat that has been made approximately four or five inches thick. This seat can use foam of varying densities in layers so that it approximates the feel of a convention spring and foam seat. Envision further—a seat that has zones of varying density that will absorb loads selectively. A practical technique of varying the density every two to five square inches is very close.

Safety knobs: It should be possible to make instrument panel, door and window knobs with either flexible or semi-rigid polyurethane foam. Chrome like finishes are possible by vacuum forming metallic Mylar film. Urethane foam, into which a light metal insert is placed, could be poured into the formed skin. This would provide a much safer knob than presently used hardware.

Instrument panel: The industry is presently using crash pads made of vinyl or urethane foam covered with vinyl or fabric. It would be possible to make the instrument panel itself safer by the use of light metal made into a sandwich construction with rigid or semi-rigid urethane, polystyrene or polyethylene foam.

(*Turn to page* 74, *please*)

Armored Vehicles in America's Future

By Raymond J. Astor
Major, Ordnance Corps, US Army

PART II

Weapon System

Armor of the future must be equipped with weapons having considerably greater capabilities than those on present-day armor. It appears that these potentialities can be realized only through the use of weapons that are considered today in the unconventional category. The day of the heavy high velocity tank gun is fast passing. It may be that the last tank has already been developed which will mount a conventional cannon. Today's cannon does not appear to possess the potentiality for increased lethality that will be needed for tomorrow. Accordingly, we must look to rocket boosted weapons, guided missiles, and similar devices for the projectile carrying components of future armor. These weapons must be capable of penetrating the heaviest possible enemy armor. They must also be capable of seeking out the desired enemy target and homing on it despite enemy countermeasures. In light of the specialized protective configurations for future armor discussed previously, provisions will have to be made for unique mounting systems for weapons on these vehicles. In fact, care must be taken that the weapons themselves do not provide an easy entrance for radiological and bacteriological material which may be encountered on the battlefield. While it is conceivable to mount the new tank weapon completely outside the crew capsule, special mechanisms will then become necessary to load the weapons.

Vision And Fire Control Systems

Future armor will be an electronic marvel. Vision and fire control must be provided through electronic means. Present vision and sighting equipment does not provide the necessary protection against atomic blast, radiation, or

New tank retriever and bulldozer designed for current use. First shown May 1960, at Fort Benning Ga. Project MAN.

even visual atomic flash. Furthermore, visual equipment creates unarmored holes reaching into the crew capsule. While these holes are kept to a minimum in size even today, they nevertheless will provide access for the lethal atmospheres of tomorrow to enter this fighting compartment. Accordingly, the visual equipment of future armor must depend on an electronic transmission link. Viewers will be mounted on the outer skin of the vehicle and the images they pick up will be transmitted electronically to screens within the fighting compartment. This type of equipment will, of course, not only provide protection against the entrance of radiological and bacteriological material but can also be adjusted so that the light level transmitted, even in the face of a blinding atomic blast, will not be sufficient to injure the operator's eyes. The electronic viewing equipment must transmit pictures superior to those received today, must have reliability above present television equipment, and furthermore provide the operator with some feeling of stereo vision so that he may get a true picture of his immediate surroundings. This concept could be carried a step further by removing the crew and viewing equipment from inside the vehicle and operating it by remote control.

Armor Signatures

Armor signatures may be defined as any output of armor which will reveal its presence to the enemy and permit his taking countermeasure action. Particular attention must be paid in future armor to the signatures produced. At the present time we know our armor produces signatures such as shape, weight, infrared radiation, seismographic disturbance, and various types of magnetic radiations. It is believed that our vehicles are producing other signatures which we are unable to detect at present. Research must be conducted to eanble us to isolate these signatures and develop devices to detect enemy armor, while at the same time preventing the enemy from recognizing our armor. It may be possible to provide the field commander with a device for altering our armor signatures at his discretion to ensure that the enemy cannot decipher these outputs.

Remote Control Mechanisms

Remote control mechanisms will assume an increasingly important role in tomorrow's armor. Since mechanical linkages, wires and hoses necessitate holes in armor, they will not be acceptable for the envisioned capsulated crew compartment. Accordingly, all controls to the power plants, steering mechanisms, certain sighting and gun controls, and other specialized operations requiring movements outside the crew compartment will have to be done by other than mechanical or hydraulic means. In this group will also be special duties that often times fall to armor, such as battlefield recovery, and placing of special types of charges. Remote control mechanisms will also be used in many instances to guide missiles into their targets. An extension of their type of control can well be used to control all vehicles that are sent forward into highly dangerous areas to accomplish specific missions without the necessity of risking personal lives. Work on this type of device has shown promise in the past and it may well be that a land-borne missile will be found to be more effective than present air-borne types under certain battlefield conditions. For instance, a very small expendable remote control vehicle carrying some type of lethal charge could be set out against enemy troops and/or vehicles and would have a high chance of reaching its target without detection. In fact, such devices could be sent into an area and concealed until the appropriate time before they were detonated.

Conclusion

Twenty-five years ago at the National War College, a report was prepared spelling out our future National defense tactical and strategical requirements. The report cited the vast progress made by industry since World War I and included the following sage observation:

"Our strategical and tactical doctrine of the future must not depend solely upon any special arm."

This observation was made long before the Sputniks and Explorers; or the first atomic bomb. The principle is as valid today as it was 25 years ago.

Our defense posture must be likened to a two-edged sword. On the one side we must deter the general war which all civilization fears. On the other, we must build up and maintain a strong limited-war capability in order to make would-be aggressors respect and fear it.

One side of this sword is sharp; the other needs to be honed. We have made tremendous advances in space-age developments. Yet, our efforts to "keep up with the Joneses" in our limited war capabilities have fallen short. We must not engage in a race to catch up.

Instead, we must assign the necessary scientific resources of the Nation to the problem of armor and achieve significant technological breakthroughs as we have in general war technology. The armor of the future may then serve as an effective limited war deterrent. ■

This is the final part of a two-part article by Major Raymond J. Astor. Part I appeared in the June 15 issue of AUTOMOTIVE INDUSTRIES.

Inco Bares Plans For New Open Pit

A new open pit mining operation will be started by the International Nickel Co. of Canada on an outcropping orebody in the Clarabelle and Lady Lakes area southwest of the company's Murray Mine in the Sudbury district of Ontario, Canada.

Production from the Clarabelle open pit is scheduled for the latter part of next year. It will not increase the company's over-all output, but will replace tonnage now being obtained from other Inco mines.

Reports From Machine Tool Builders Point to Uncertain Business Trend

By Charles A. Weinert
EASTERN EDITOR

AI QUARTERLY SURVEY Reveals—

Reductions in Inquiry Activity, Less Optimism and Some Uncertainties as to Near-Future Business Upswing, But, Nevertheless, a Good Potential

FACED with an unexpected sizable drop in orders during April and May, the machine tool industry, at June 1, was conservative in predicting prospects for near-future business improvement.

That is the major overall impression gained from 35 special reports to AI. These reports were supplied by leading machine tool builders in connection with AI's current quarterly survey.

Inquiry activity at June 1, compared to that at January 1, 1960, is reported to be down an average of close to four per cent. And the business views of the builders for the 2nd Half of this year indicate no industry gain—in fact, a very slight decline—from the 1st Half.

On the other hand, order backlogs at June 1, on the whole, were still up compared to January 1. Three companies, as a matter of fact, reported backlogs more than doubled.

The latter, once again, emphasizes that the situations of individual companies do vary widely one with another. Some companies are doing very well indeed, while others are not in as favorable a position. Therefore it should be kept in mind that the data being presented are from an *overall industry* standpoint—and do not necessarily apply to any one company nor to a particular segment of the machine tool industry.

On the optimistic side also, perhaps the current picture may be "the lull before the storm." In the prior survey of machine tool business trends reported in AI for April 1, 1960, a number of the builders predicted a decline in business in the months preceding The Machine Tool Exposition-1960 —then a strong pickup.

Consequently we are led to believe that the climate now prevalent in the machine tool industry, being of immediate concern, has tended to tone down some of the prior optimism to an unjustified extent.

In any case, the following are the overall industry figures obtained from consolidations of the 35 builders' reports:

Order Backlogs

With respect to unfilled orders on hand June 1 versus Jan. 1, 1960:

Backlogs of "about the same" volume were reported by 7 companies.

Increased backlogs applied to 18 companies, including three with increases of 120, 190, and 230 per cent, respectively—for an overall *average* increase for the companies in this group of +50 per cent, or about half that (25 per cent) with the top three not included.

Decreased backlogs were reported by 10 companies, ranging from −8 up to −27 per cent, with a group average of −17 per cent.

For the 35 companies combined, the average was +21 per cent unadjusted—or +6 per cent with the top three performers not included.

Typical comments from individual builders on this item in the AI survey questionnaire are as follows:

George Gorton, president, George Gorton Machine Co. — "New orders were slow in May." (He reported his company's backlog as "about the same.")

A. V. Bodine, president, Bodine Corp.—"Two defense orders make up most of the increase,"—indicated as being 190 per cent.

R. A. Young, general sales manager, Seneca Falls Machine Co.—"We like this,"—an increase of 120 per cent.

Automotive Orders

Each of the companies was asked, "How much of the total of your orders on hand as of June 1 is represented by orders from automotive companies?"

The vast majority (29 companies) reported automotive orders in process, with proportions ranging from as little as one up to 100 per cent—and averaging out at 35 per cent of the orders carried by this group.

Six companies stated they had no automotive orders on hand.

Inquiry Activity

The relationship of inquiry activity at June 1 to that which ap-

plied at Jan. 1, 1960, was requested.

Inquiry activity at the same level was reported by 12 companies.

Increased activity, ranging from +5 to as much as +40 per cent, was indicated by 9 companies—with an average group increase of +21 per cent.

Reduced activity, from −2 to as much as −85 per cent pertained to 11 companies—averaging out at −28 per cent, or at −22.6 per cent with the unusually-high individual down of −85 per cent not counted.

For the total of 32 companies reporting in a definite manner, the average inquiry activity was −3.7 per cent.

Typical comments from individual builders:

George Gorton, president, George Gorton Machine Co.—"Shows signs of slowing down. Had good activity 1st Quarter."

A. W. Blackshaw, sales manager, Hannifin Co.—"Number of new quotes is about the same, but cumulative total outstanding and considered still active increased about 30 per cent."

Business Outlook

Inquiry as to the outlook for new order receipts in the 2nd Half versus the 1st Half of 1960 brought forth the following responses:

The same volume was predicted by officials of 16 companies.

An upward trend, from +3 to as much as +20 per cent, was opinioned by 9 officials—averaging out at +10 per cent.

Decreased order receipts, from −10 to as much as −50 per cent, were predicted by 5 officials—with a group average of −24 per cent.

Overall, among the total of 30 executives giving definite indications, the average was slightly less than "the same"—minus one per cent.

Comments from individual builders:

Company Spokesman—"Don't really know as yet."

George Gorton, president, George Gorton Machine Co.—"Difficult to predict what effect Machine Tool Exposition will have on buying pattern."

Company Spokesman—"Expect some improvement in last quarter."

G. K. Cassady, general sales manager, Giddings & Lewis Machine Tool Co.—"Expect upturn following the Exposition in Chicago."

Automotive Prospects

The question was asked as to whether any sizable automotive business was in sight.

Six companies said "yes," and 27 companies said "no."

Comments on this item included the following:

G. M. Stickel, president, Landis Machine Co.—"Substantial business pending in thread rolling equipment."

Wm. C. Goeckel, sales manager, Snyder Corp.—"No, but very optimistic about future changes."

E. M. Hicks, vice-president, Norton Co.—"No programs in sight, but expect continued automotive demand, particularly for export."

G. K. Cassady, general sales manager, Giddings & Lewis Machine Tool Co.—"Yes, due to new product development."

F. Steele Blackhall, executive vice-president, The Taft-Peirce Mfg. Co.—"More apparent activity than we have seen in several years."

A. W. Blackshaw, sales manager, Hannifin Co.—"Yes, but only for immediate future. Long trend is uncertain."

Equipment Deliveries

Those addressed were asked whether deliveries were apt to run longer on orders placed in the 2nd Half, compared to those for orders placed in the 1st Half 1960.

The same delivery rate is estimated by 21 companies.

Longer deliveries—from increased times of one to eight weeks—are predicted by 9 companies.

Shorter deliveries are expected to apply in the case of 5 companies—from two to four weeks generally.

Individual comments:

J. P. Crosby, vice-president of sales, The Lapointe Machine Tool Co.—"Yes, two weeks longer. All specials require a large amount of engineering."

Company Spokesman—"No change at present. Future deliveries will depend on amount of new business."

Company Spokesman—"Shorter, but dependent on type of machine ordered."

F. Steele Blackall, executive vice-president, The Taft-Peirce Mfg. Co.—"Yes, but difficult to spell out actual lengthening."

A. V. Bodine, president, Bodine Corp.—"Now quoting 20 weeks' delivery—apt to increase."

Automotive Recommendations

The builders were also asked, "Do you have any personal recommendations to make to automotive industry officials which should be taken into account by them when planning for near-future tool acquisitions?" Here are a number of the responses:

T. L. Strimple, president, The National Acme Co.—"Definitely. The cost-price squeeze on the new economy cars can only be met by improved quality and productivity of the latest and most productive machine tools."

Wm. C. Goeckel, director of sales, Snyder Corp.—"Try to order machines nine months ahead of production schedule, instead of six months.

Company Spokesman—"Contact machine tool builders now about near-future requirements, as they will tell you what will be new at the Exposition. Don't hold up ordering and suffer longer deliveries later."

George Gorton, president, George Gorton Machine Co.—"Have buyers check more carefully into quotations submitted—

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SAE Summer Meeting Largest Ever Held

By Charles A. Weinert
EASTERN EDITOR

New Attendance Record Set at the Society's National Event

NUMEROUS advancements in automotive technology were strikingly made evident at the Summer Meeting of the Society of Automotive Engineers. It was the largest event of its kind to date. Relocation to a more centralized area, combined with a greatly expanded technical program, brought heavy participation and widespread subject coverage.

Held in Chicago for the five-day period of June 6-10, the Society's national event drew an attendance of more than 1800 automotive executives and engineers—at least half again more than before. By comparison, last year's Summer Meeting at Atlantic City—where the meeting was held for several years in succession—had an attendance of roughly 1200.

The program this year was made up of 34 sessions at which were presented 79 technical papers plus three panel discussions. Another feature was a visit to the sheet and plate rolling mill of Reynolds Metals Co. at McCook, Ill. Last year's meeting, again for comparison, had 20 sessions, 45 papers, and four panel discussions.

With such an agenda, it will be obvious that the subject content was both extensive and varied. Major topics comprised the following:

Engine items included combustion research, cam design, noise reduction in small engines, gas turbines, design of International-Harvester's new Model 817 Diesel, Texaco's fuel-injection spark-ignition cycle, and Diesel engine crankcase cavitation-erosion.

Lubricants for transmissions and rear axles, and studies on lubricating oil consumption in engines were discussed.

There were papers on heat treating — a polyvinyl alcohol type quenchant, the Kolene Corporation's "Tufftride" nitriding process, and engineering of convection in heat treat furnaces.

Fuel cells, radioisotopes in machining, and plasma propulsion were among the "more exotic" subjects viewed.

Truck brakes, tire wear and operating phenomena, passenger car skidding studies, the effect of traction on cornering force, windshield wipers, and body fabrics came in for discussion.

Plastic-clad metals, fuel economy and vehicle acceleration simulations, engine mountings, powerplant bending noise problems, vehicle washing, and value engineering were additional topics.

Plant layout analysis, surface finish and roundness measurement, design of one-way clutches, and transmission gear design and manufacture were other major subjects.

Finally, passenger car and truck seating, development of new markets and management control, and traffic safety tied in with the new roadbuilding program were discussed at the three panel sessions by specialists in these fields.

The foregoing will indicate the comprehensiveness and wide appeal of the subject content of the technical sessions.

Horning Memorial • Award •

Another important highlight was the annual presentation of the Horning Memorial Award. This honorary award is presented each year to the author or authors of a paper given before an SAE meeting during the preceding year that is judged to contribute the most to expanded knowledge of combustion phenomena in engines.

The award recipients this year are E. S. Starkman, associate professor at the University of California, and W. E. Sytz, research engineer with the California Research Corp. They received the honor in recognition of their co-authored paper entitled, "The Identification and Characterization of Rumble and Thud," presented at the 1959 SAE Summer Meeting. (Reference was made to this paper in AI, July 15, 1959, page 64.)

• Deposit Ignition •

Much work has been done over the years, but apparently some of the aspects of combustion in reciprocating engines are not thoroughly understood or resolved. At least this was the opinion expressed by the co-authors of a paper presented at an all-day session devoted to combustion research developments.

Specifically, and we quote, "Despite the long history of interest in the subject, the mechanism of ignition by hot surfaces, whether caused by deposits or by hot spots in the combustion chamber, is not well understood. This should not be surprising since the ignition mechanism of spark knock, which has received considerably more attention than deposit ignition, has

not been completely elucidated.

"Nevertheless, the problem of deposit ignition in today's automotive engines is one of serious proportions, gradually approaching the problem of spark knock in overall performance. A number of abnormal combustion phenomena which can be traced to deposit ignition as the origin have been identified—for example, pre-ignition, wild ping, and, more recently, rumble. The problem therefore requires continued effort to understand the mechanism of deposit ignition so that the most effective remedial measures can be determined."

The co-authors of this paper—F. W. Bowditch and T. C. Yu of General Motors Research Laboratories—then went on to explain their studies in measuring the ignition of a group of fuels both by induced engine deposits and by hot wires, the latter simulating hot spots. They found the ignition resistances of fuels were dependent on the type of surface causing ignition. And that with an ignition mechanism based on the assumptions that the fuel-air mixture must be heated above its ignition temperature and its composition be within the limits of inflammability—in other words, the same ignition process regardless of type of surface—much of the experimental data could be duplicated.

The co-authors stated that such a proposed mechanism provides explanations for the difference in surface temperature requirements to cause ignition by various surfaces, the difference in deposit and hot spot ignition resistances of fuels, and for the fact that ignition sometimes occurs at a distance from the surface causing the ignition.

They added, however, that the mechanism is not complete. Consideration of the joint effects of temperature on rich limits and of rich limits on ignition have not been clarified, nor are the total effects of dilution yet known.

Mechanism of • Combustion •

C. E. Welling, G. C. Hall and J. S. Stepanski of Ford Motor Company's Scientific Laboratory presented a paper on the "Concurrent Pyrolytic and Oxidative Reaction Mechanisms in Precombustion of Hydrocarbons." They described analytical studies using n-butane and n-pentane as fuels.

These authors, as one of the results of their investigation, concluded that it appears that cracking and hydrogen stripping of the fuel may contribute to auto-ignition. They stated such reactions in the precombustion of a paraffin fuel are indicated to afford sources of H atoms, HO_2 free radicals, and perhaps indirectly of OH free radicals—one or more of which are generally believed to be the active agents in auto-ignition.

Heat Cycle • Analysis •

Unsteady heat transfer in engines was the subject of a paper co-authored by V. D. Overbye, O. A. Uyehara and P. S. Myers of the University of Wisconsin, and J. E. Bennethum of General Motors Research Laboratories. The investigation described had as its prime objective the development of a system for measuring internal temperatures so that subsequent analysis could account for heat transfer during an engine cycle.

For the purpose, a thermocouple placed one micron below the surface of the combustion chamber wall of an engine was used in combination with oscillographic equipment to give recordings of the combustion chamber metal surface temperature as a function of time. The data were taken both with the thermocouple free of deposits and with the thermocouple covered with a deposit.

In the tests without deposits, it was disclosed that the maximum heat transfer rates to the cooling water in unsteady heat transfer may differ from steady-state values by as much as a factor of 20. This was said to clearly indicate that considerable heat is transferred from the gases to the wall during combustion and expansion, and then transferred back to the gases during intake and compression.

Tests with deposits were made to provide a measurement of their influence on heat transfer. Under this condition, it was determined that the thermal characteristics of the deposits and their effect on heat transfer is significantly influenced by the chemical structure and boiling point of the fuel, as well as by its additives. Also that a small amount of "dirty fuel" blended with a "clean fuel" is sufficient to produce deposits similar to those produced by the dirty fuel alone.

End-Gas • Temperatures •

Various methods for measuring the temperature of the unburned fuel-air mixture in an operating engine before knock or normal flame propagation were outlined in three papers.

W. G. Agnew of General Motors Research Laboratories described the application of a two-wavelength infrared emission method. He indicated that while it has several advantages over other techniques, its most significant contribution seems to be its use as a source for comparison with other methods.

During the studies reported by Mr. Agnew, it was confirmed that unburned gas temperatures increase with increasing inlet temperature, coolant temperature, engine speed, spark advance, throttle opening, and exhaust back pressure, and with decreasing fuel octane number. Also that end-gas temperature is at a maximum near the maximum-power fuel-air ratio, and decreases with richer and leaner mixtures.

M. C. Burrows of the National Aeronautics & Space Administration, S. Shimizu of Nagoya University (Japan), and P. S. Myers and O. A. Uyehara of the University of Wisconsin described use of an infrared radiation pyrometer utilizing water vapor as the sensing medium.

M. E. Gluckstein, C. Walcutt and R. R. Acles of the Ethyl Corp. reviewed their investigations using a technique that measures tem-

peratures of end gases based on the relationship between temperature and the speed of sound traveling through a gas. The method was developed at the Massachusetts Institute of Technology, and in principle consists primarily of measuring the velocity of sound in a gap between two sound transducers mounted in an insert between the cylinder head and block. In the Ethyl test setup, a balanced-pressure-type pickup was also used.

Among the findings was that for given knock-limited operating conditions, primary reference fuels of different octane level and composition provided relatively-constant final end-gas temperatures of about 1380 F. However, their pressure values varied from about 200 to 700 psia.

The unchanged end-gas temperature for different fuels under fixed engine conditions was attributed to the increased precombustion reactivity which occurs as the octane number is lowered. The authors said they believed the increased heat released by precombustion tends to compensate for the lower knock-limited compression ratio as the octane number is reduced.

• Fuels and Knock •

Evidently octane-number and hydrocarbon-type designations are not wholly indicative of the road antiknock performance of gasolines under part-throttle and high-speed full-throttle conditions.

This was the overall conclusion presented in a paper co-authored by F. D. Buerstetta and I. A. Caputo of Ethyl Corp. and E. S. Corner, T. M. Korn and E. C. Younghouse of Esso Research & Engineering Co.

Their investigation was centered around determining whether the hydrocarbon-effect previously observed in road antiknock studies of gasolines was independent of other fuel properties beyond laboratory octane numbers.

It was determined, for example, that an increase of aromatic content (with a decrease of olefins) improves the road antiknock performance of fuels having the same octane numbers, tetraethyl lead content, and sulphur concentration. On the other hand, with high sulphur content (e.g. 0.15 per cent by weight) the road advantage of a leaded aromatic blend over a leaded low-sulphur-content olefinic fuel can disappear or even reverse. These compositional factors, they said, become even more important at part throttle than at full throttle.

The authors suggested that fuel variables other than octane numbers be considered when predicting the road performance of fuels. They stated, however, that additional work needs to be done to establish the inter-relationships of lead, sulphur, and hydrocarbon composition, especially at intermediate concentrations of TEL and sulphur.

• Tetramethyl Lead •

The relative advantages of tetramethyl lead—$Pb(CH_3)_4$—over tetraethyl lead—$Pb(C_2H_5)_4$—as an antiknock compound were expounded in four papers presented by research engineers from Socony

(*Turn to page* 62, *please*)

Meet the AI By-Liners

A brief biographical sketch of the editors and contributors to AI whose by-lines appear regularly

Introducing William J. Smyth

BEST known among manufacturers as a Regional Manager for AUTOMOTIVE INDUSTRIES, William J. Smyth is principally known to AI readers as the author and contributing editor of major articles featuring automobile racing. Although his offices are in the Meadows Building, Dallas, Texas, "Bill" maintains a strenuous travel schedule attending automotive racing events which he covers separately and apart from his regular business responsibilities.

At present, he is a member of the Board of Directors of the United States Auto Club (the sanctioning body of such racing events as the Indianapolis 500, Daytona International Speedway Racing and Sport Car Events, the Bonneville Salt Flats Speed Trials and the Mobilgas Economy Run). He is also Chairman of the Road Racing Division of USAC. This road racing division sanctions the major international professional road races in America. He has been the Chief Steward at Sebring (12-hour race), the Nassau-Bahama and Cuban sports car race and the Great American Mountain Rallye. Currently he prepared the special report on the 1960 Indianapolis 500 which appeared in the last issue of AI, June 15, 1960, page 47.

Automatic Static Balancing of Rotating Parts

By
Joseph Geschelin
DETROIT EDITOR

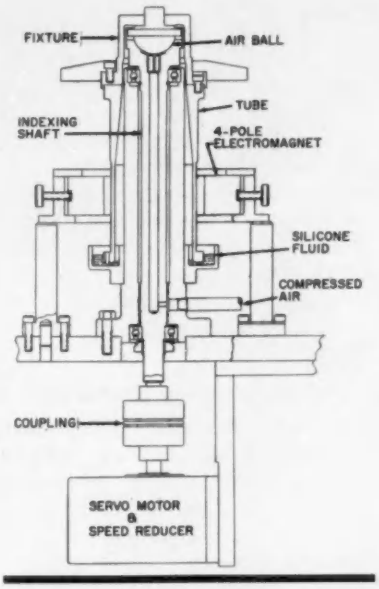


Fig. 1—Schematic drawing of the unique air ball mechanism—heart of the GMR static balancing equipment.

Fig. 2—Experimental version of the balancing machine originally designed for the static balance of the rear planet carrier.

NOTEWORTHY technique for the static balancing of a variety of rotating parts has been introduced by the Research Laboratories of General Motors Corp. This improved principle stems from an earlier project solved by the Special Problems Department of GMR — an automatic balancing machine for wheel and tire assemblies, operated without spinning the assembly. The early balancing machine was incorporated in a continuous roller conveyor line at Oldsmobile (see AI, March 1, 1956).

The new method indicates the amount and location of unbalance, and also makes the correction — all in a fully automatic cycle. The basic principle can be embodied in machines for balancing many kinds of rotating parts such as wheel and tire assemblies, stators and rotors, brake drum assemblies, etc.

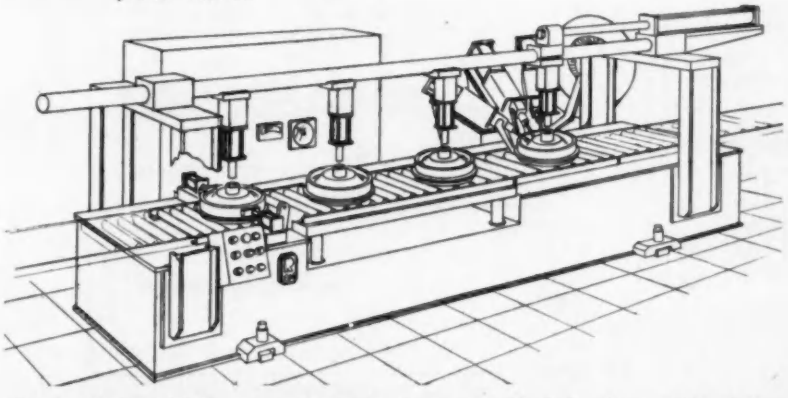


Fig. 3—Sketch of fully automatic brake drum assembly balancing machine being built for one of the motor car manufacturers. Centering of the assembly is done at the first station at the left; unbalance measuring at the next station; then indexing; and welding at the last station.

The basic concept centers about a unique air-ball pivot as shown in Fig. 1. It consists of a frictionless air ball pivot attached to a fixture that supports the work. Hanging rigidly from the fixture is a long tube, extending slightly into a pool of silicone fluid. It may be seen that this design permits the work to tilt the entire assembly in the plane of unbalance. The silicone fluid serves as a damper to prevent pendulum action as well as to bring the part to rest in the shortest possible time interval — usually one to two seconds.

Major feature of the device is the method by which the amount and location of unbalance are detected. Referring to Fig. 1, there is a four-pole wound stator, serving as an electromagnet without restricting the movement of the tube. Detection is accomplished by measuring the change in magnetic reluctance between each pole face and the tube surface when the tube swings to an off-center position. These changes are combined electronically to produce two independent signals: one represents the amount of unbalance, the other the angular location.

Since this design does not involve mechanical coupling between the tube and detector components, both unbalance measurement and corrective operations can be performed automatically at the same station. Because of this the design has great flexibility. The machine can be designed as a simple or semi-automatic indicator; or as a fully automatic unit. Another advantage of the elimination of mechanical coupling is that no linkage adjustments are required and no friction to contend with. Consequently, the improved version has a much higher degree of sensitivity, is capable of balancing precision

(*Turn to page* 83, *please*)

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By C. J. Kelly
ASSISTANT EDITOR

INCREASED PRODUCTION WITH AUTOMATED CONTROLLING

A SPOKESMAN for Micro-Path, Inc., a subsidiary of United Industrial Corp., estimates there are over one and one half million existing machine tools that could benefit in productivity and economy by applying the Micro-Path system to these units.

Applicable as original equipment, or to retrofit existing equipment, this electronic system of magnetic tape control features point-to-point and continuous-path positioning control. It is reported to be a new technique that will increase production from 40 to 1000 pct, and turn out uniform parts and castings without variance.

The same equipment used to perform the work also can be used to prepare the automated program.

How It Works

Using a stylus connected to the machine tool, the operator may record on magnetic tape in the electronic console impulses for the tracings of any part to be duplicated.

As pressure is applied to the stylus, the Micro-Path system generates the necessary electrical impulses to produce motion. Thus, by pressing the stylus longitudinally, transversely or obliquely, motions in these same directions are carried out. Commands for each direction are automatically recorded on separate channels of the tape as they are produced. Similar recordings may be made from a recording table independent of the machine tool, from precise numerical points indicated from rough or finished drawings, or from templates. The tape alone, by means of the playback, controls the machine's movements in producing subsequent parts which are exact duplicates of the original without the guidance of an operator.

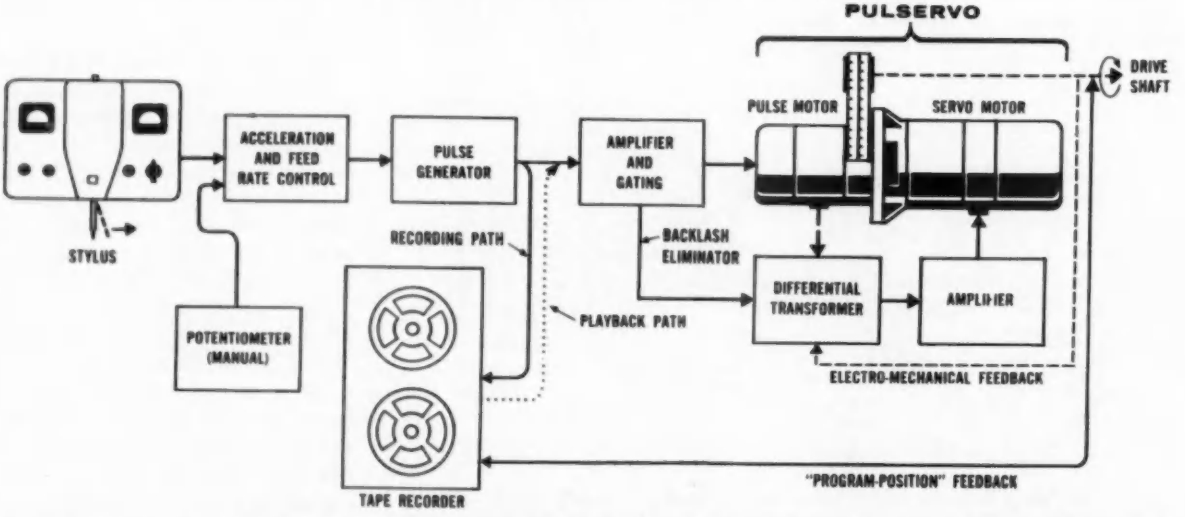
Magnetic Tape Recording

The same electrical pulses used to create motion in any desired pattern simultaneously recorded on magnetic tape. Any work cycle properly executed once can then be repeated accurately.

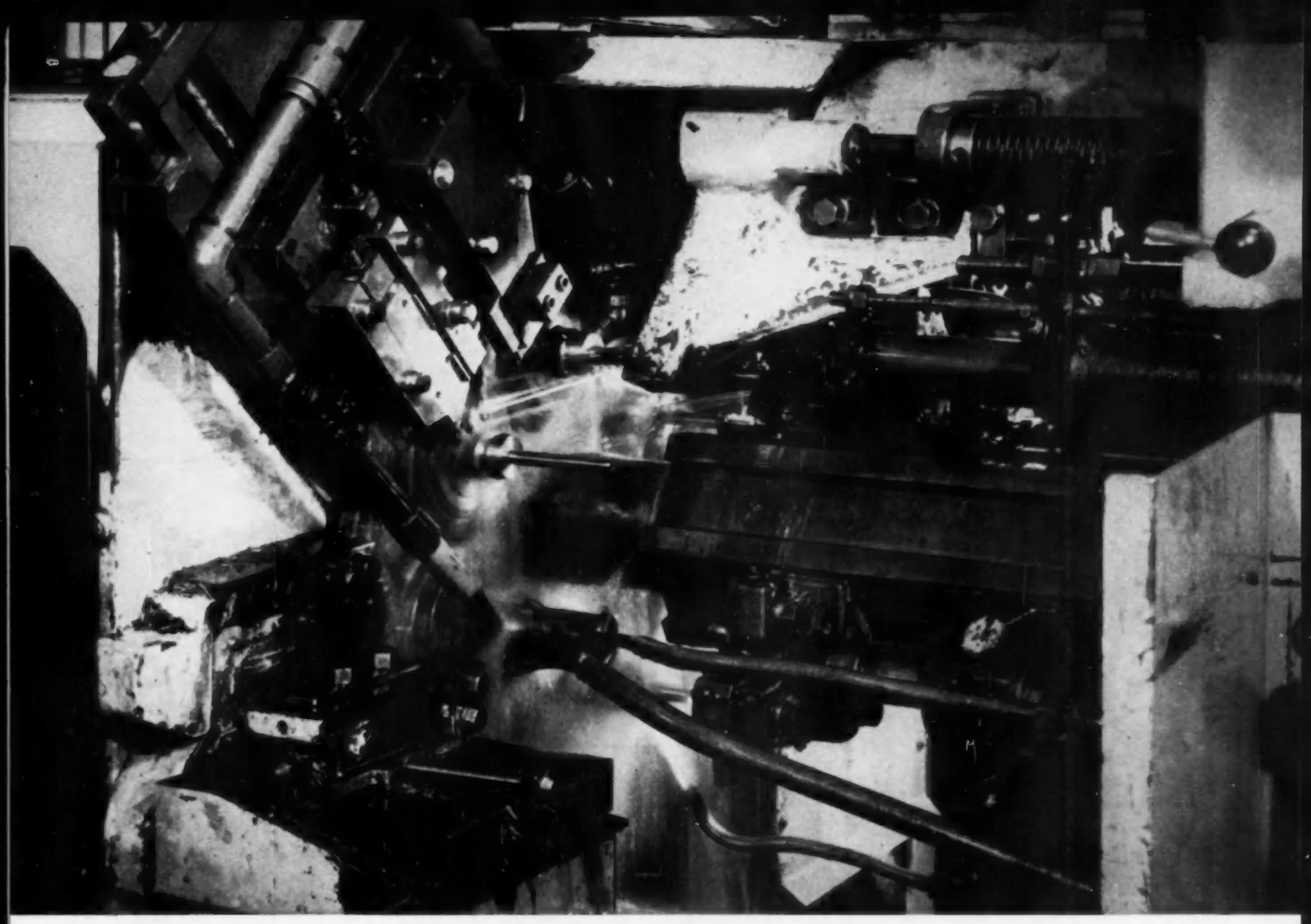
Simple Programming

The same equipment used to perform the work can also be used to prepare the program. Most point-to-point programs are numerically plotted on rough sketches according to known X-Y co-ordinates. Measurements between points are determined by conventional counters. This system can use such devices as templates, compasses, triangles, protractors and similar tools. These are used to produce curved and angular paths, following print specifications. ■

FUNCTIONS OF THE MICRO-PATH CONTROL SYSTEM



An important feature of Micro-Path control consists of eleven different channels on each tape. Channels are designed to accommodate a wide range of motion requirements on every program.



TOUGH, ON-THE-JOB TESTS LIKE THESE CONVINCE USERS

Texaco Cleartex Performs Better

ON BOTH CUTTING AND LUBE SIDES!

Company A: a leading bearing manufacturer (name on request).

Job: forming and cut-off of 52100 and C-1118 tube stock for bearing races.

Had been using: three petroleum products; one on lube side, one on cutting side, one to build up cutting oil diluted by lube oil.

TEST: Texaco Lube Engineer recommended dual-purpose Cleartex 140 for *both* cutting and lube sides of 2⅝" Conamatic for thirty day trial.

RESULTS: better finish, improved tool life, no dilution of cutting oil. Company switched *all 30 automatics* to Cleartex. After 6 months, no addition of base oil needed!

Company B: a well-known maker of cable (name on request).

Job: machining 303 Stainless brake cable nipple.

Had been using: three products—lube oil, cutting oil and base oil.

TEST: Texaco Lube Engineer recommended Cleartex 140 for *both* cutting and lube sides of 1⅝" six spindle Greenlee.

RESULTS: after two weeks, company began gradual switch-over of *all 22 automatics* to Cleartex! Got better tool life, improved finish on wide variety of steels, stainless and brass! Six months later—no compounding needed, even after tapping tough stainless!

A Texaco Lubrication Engineer will help you select the Cleartex grade which can give you similar results on your automatics. Just call the nearest of the more than 2,300 Texaco Distributing Plants, or write:
Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Circle 120 on Inquiry Card for more data

DOW

Proving ground for

AUTOMOTIVE CHEMICALS

At Dow, where the test tube often serves as test track for automotive fluids, there is a dedicated group of men who are exceedingly car conscious. These men of Dow's Automotive Chemicals Laboratories—car buffs in their own right—work together enthusiastically with automotive engineers on a wide range of developmental applications, both current and future. The results of this natural cooperation may take the form of a better brake fluid, a safer metal cleaner, or a synthetic lubricant . . . one with properties for "years ahead" applications such as the new polyphenyl ethers . . .

NEW LUBRICANTS SHRUG OFF OXIDATION, RADIATION AT HIGH TEMPERATURES

Polyphenyl ethers exhibit marked improvements in lubricating properties and the ability to "take it" under adverse conditions. They're the result of a long range research program on synthetic lubricants at Dow . . . one of primary interest to forward-thinking automotive engineers.

Continuous research on synthetic lubricants in Dow's Automotive Chemicals Laboratories has spotlighted the polyphenyl ethers. These chemical materials have exceptional lubricating properties and excellent stability in the presence of oxidation, radiation and high heat.

Their lubricity is comparable to the diester lubricants; in the Shell 4-Ball Wear Test, for example, the scar diameter is 0.9 mm. when operating at 600 rpm and 400°F for one hour at a loading of 50 kg. Polyphenyl ethers are resistant to radiation—changes in viscosity are minor after absorption of 1×10^{11} ergs per gram. In a non-oxidizing atmosphere, some polyphenyl ethers withstand 800°F for about 100 hours. In an oxidizing environment polyphenyl ethers can be used for long periods of time at temperatures up to 600°F. Low temperature use is currently limited to 30°F.

Dow is currently working with industry to perfect practical applications. The high resistance to radiation of polyphenyl ethers suggests their use in nuclear-powered aircraft and surface vehicles.

This research and developmental work is part of an over-all program on synthetic lubricants of all types, including the large and versatile polyglycol family. The polyglycols are characterized by many desirable lubricating properties. They have a high natural viscosity index, are non-carbonizing, and display improved oxidation and shear stability, sludge and varnish resistance. Polyglycol lubricants are used today in such diverse applications as crankcases, gas turbine engines, and hydraulic fluids.

Synthetic lubricants pass lubricity exam for power steering pumps.

V. I. improver research shifts into high

Although viscosity index improvers are young as additives go, they're doing a man-sized job in many lubricating oils. Continuous research on them

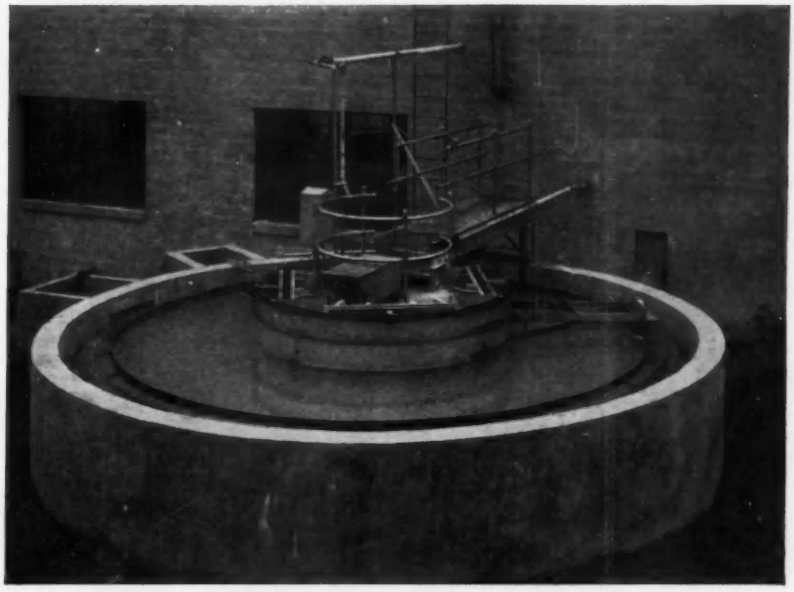
is being carried out at Dow—in fact, it's currently being speeded up in Dow's Automotive Chemicals Laboratories. Why? Because the tasks V.I. improvers are asked to perform have rapidly multiplied. Present "extra-curricular" jobs as pour point depressants and detergents are varied and complex; yet vastly improved properties will be expected of the V.I. improvers of a few years from now.

As an example of the specialized, modern research equipment utilized in this work: Dow has developed an apparatus that simulates 20,000 miles of road testing in just one hour's time! Similar testing devices are now being perfected in the lab.

Shear-testing V.I. improvers under "road test" conditions.

That settles it!

When plant engineers have an industrial waste problem, they often find the answer in Dow's family of flocculating agents. Separan® NP10, for example, speeds settling rates of solids in solution and improves clarity. It also does an outstanding job in water treatment and in most types of processing operations.



Waste solids in solution settle out quickly with Separan NP10.

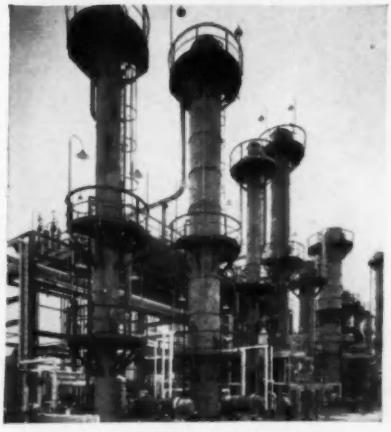
Polyols for every purpose

Dow offers industry "the world's widest line of polyols." These specialized chemicals are used in a broad range of fluids of interest to automotive engineers: brake and power steering fluids, synthetic lubricants and transmission fluids, coolants, antifreezes and hydraulic fluids.

Some of the newest of the automotive materials made from Dow polyols are the urethane foams used as seat cushioning material. Dow provides foam manufacturers with Voranol*—special resin-grade polyglycols tailored to meet the exacting requirements of the flexible foam industry. Because Dow is *basic* in polyols, it can provide custom-made materials best suited for any particular customer application. There's practically no limit to the kinds of polyols Dow can produce!

*TRADEMARK

From Dow operations like this come the "world's widest line of polyols."



WANTED: TOUGH PROBLEMS!

The men of the Dow Automotive Chemicals Laboratories are leading with their chins. They welcome any technical chemical or chemical engineering problem—on current or future applications—concerning automotive chemicals. Your inquiry will receive prompt attention by our research staff. Contact the Dow sales office near you or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Chemicals Merchandising Dept. 403T7-1.

THE DOW CHEMICAL COMPANY
Midland, Michigan

DOW

Circle 121 on Inquiry Card for more data

News of the MACHINERY INDUSTRIES

Warner & Swasey Co. Opens Research Center, Unveils New Machines

By Charles A. Weinert

At a press conference held early last month in Cleveland, The Warner & Swasey Co. unveiled not only a new research center, but also major developments in machine tools. The occasion further marked informally the 80th Anniversary of the company's founding.

The newly-completed research center, first occupied in March of this year, is at Solon, O., east of Cleveland. Its modern one-story building of brick and aluminum construction contains over 40,000 sq ft of floor space. Besides machine tool development projects, the new research facility will handle design and test work on textile machinery and earthmoving equipment.

Separate departments within the center include machine design, systems design, electronic controls, servo development, instruments, metal cutting and metallurgical laboratories, and research engineering. In addition, it has a prototype shop capable of fabricating full-scale working models of new product designs; also a high-bay general test section.

The most unusual machine tool development revealed—and, incidentally, all of the several new ones unveiled will be exhibited by W&S at The Machine Tool Exposition-1960 — is the SCA-25 Servofeed turret lathe (illustrated). As will be noted, its bed, bedways, cross slide, saddle, and turret are inclined.

This machine, which has a 25-in. swing, features an electronic "memory" system which stores and subsequently repeats operations of a machining cycle. During setup the operator merely pushes a "record" button at the end of each acceptable cut, and the system records such factors as feed, speed, start-of-cut, and workpiece dimensions. Then on succeeding workpieces, the machine repeats these operations automatically.

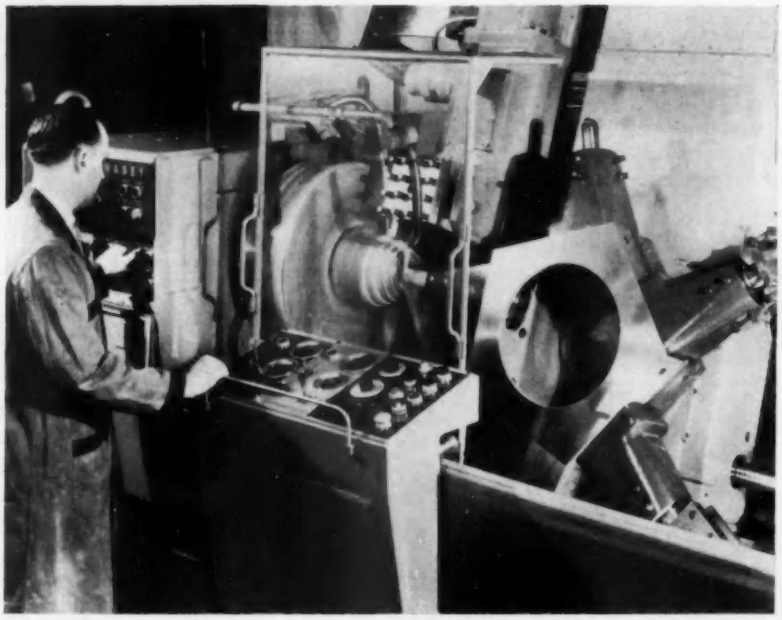
Should an alteration be required later in any of the individual operations—say to compensate for tool wear adjustment—the change can be made without affecting the other settings in the cycle.

Supplementing the lathe's basic memory control is an incremental tape path-control system that is used solely for contouring. In operation, the memory system sets the starting point for the contour, then the tape control automatically takes over the contouring operation. This is a four-axis device. The entire electronic control system is of W&S design and manufacture.

Warner & Swasey also now has a new smaller single-spindle automatic chucking machine, called the O-AC. It was designed for work on precision components such as computer and guidance system hardware. Its nominal workpiece range is 3-in. diam by 3-in. long. Air chucking is used on a 6-in. diam chuck. Spindle speed operation, plus front and read cross slide and turret feed operations, are automatic.

The No. 2 Micro-Cut turret lathe is another new machine development, designed for precision machining of small parts. It has a swing of 14 in. over the bed and 6 in. over the cross slide. Its

(*Turn to page* 62, *please*)



New SCA-25 Servofeed turret lathe, developed by Warner & Swasey, has a "memory" system which stores and repeats machining operations without use of tape.

YOUR MOST OVERPAID OPERATOR

Are you *sure* you are making full use of the manpower and the machine productivity you are paying for? Are you handicapping your operator—tying him to inefficient, obsolete equipment? You may be doing just that, even though your equipment is just ten years old—for the average ten-year-old is only 60% as efficient as its 1960 successor.

AUTOMATIC LATHES CUT COSTS

With increased competition and rising costs, increased production efficiency is vital if profit levels are to be maintained. More and more plants are turning to the advantages of automatic lathes.

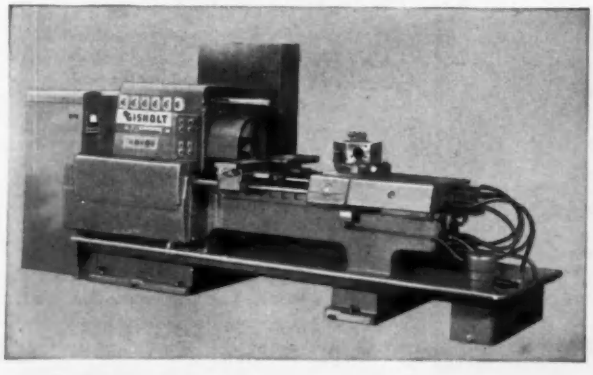
Lower costs, less dependence on operator skill, faster production on a wide variety of jobs—these are just a few of the many benefits offered by the Gisholt family of automatic lathes.

BOOST OPERATOR PRODUCTIVITY

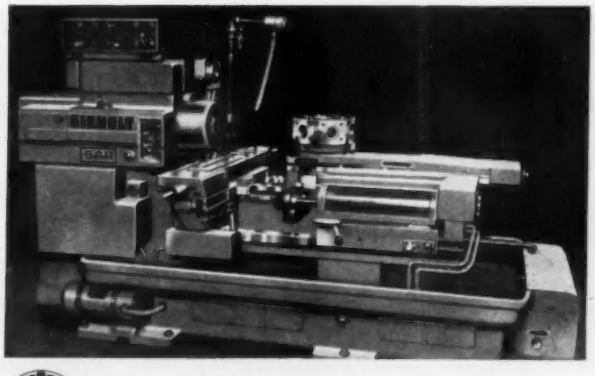
These new Gisholts handle intricate machining steps in rapid sequence—automatically—allowing your operators to handle two or more machines without extra effort.

Get all the facts now—call your Gisholt Representative or write for literature on the Gisholt machines shown—the Fastermatic with new FeeDial® control and the AR Turret Lathe.

Gisholt MASTERLINE® FASTERMATIC®
Automatic Chucking Turret Lathe



Gisholt MASTERLINE AR®
Automatic Ram Turret Lathe



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Circle 121 on Inquiry Card for more data

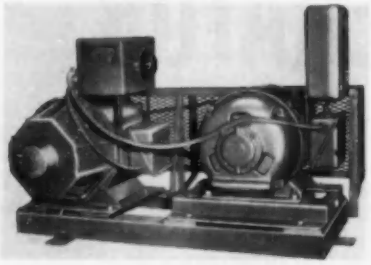
NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

New Alternators

HIGH-FREQUENCY motor alternators have been designed for operation in the 360 to 3300 cycle range. The alternator assembly features a high-frequency alternator, a silicon

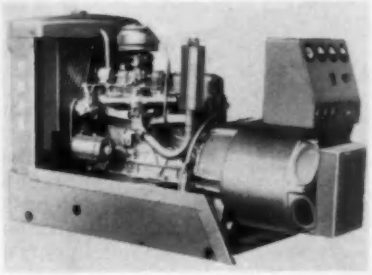


rectifier unit with time-delay fuses for field excitation, and a drive motor. All three features are welded on a heavy steel base, with a removable belt guard and sliding alternator base for easy belt adjustment. *Industrial Motor Div., Robbins and Myers, Inc.*

Circle 50 on postcard for more data

Gasoline Electric Plants

MAGNECITER generators have been specially developed for use with the manufacturer's line of engine generator sets. Formerly available only on larger units, the new



generator is now standard on all Onan gasoline and Diesel plants 25K and larger. According to the manufacturer this development will provide more efficient operation in both standby and primary applications. *D. W. Onan and Sons Inc.*

Circle 51 on postcard for more data

New Lift Trucks

THREE new lift trucks in the 3,000, 4,000 and 5,000-lb. capacities, respectively, have been announced.

Designated as the F-30, F-40 and F-50 lift trucks, the new units are designed, engineered and constructed with emphasis on ruggedness, economy, service accessibility and operator comfort and safety.

The new lift trucks are powered by new gasoline or LP gas engines developing a maximum 52 horsepower.

The new models are available with either the standard transmission or, as optional equipment, power-shift torque converter drive. The standard transmission is a heavy-duty, constant mesh unit providing two forward and two reverse speeds. The optional transmission transmits torque smoothly and efficiently from the engine to the drive wheels. Instant change of direction is accomplished by a flip of the control lever positioned at the left on the steering column. *The Allis-Chalmers Mfg. Co.*

Circle 52 on postcard for more data

Machining of Radioactive Material Safely

A complete two axis double ended servo system was recently designed and fabricated for remote control of a small tool room lathe. The prime purpose of the system was to provide all necessary operation functions at a remote console so that radioactive materials could be machined. The system provided carriage control both longitudinally and cross feed. Other operations, such as loading work, closing collet and changing tools, were to be accomplished by manipulators. United Control Systems, Inc.

Circle 53 on postcard for more data

Deburring Machine

A NEW type Machine has been designed and developed for the specific purpose of deburring and finishing cylindrical-shaped (not necessarily symetrical) parts which require work to be performed on the inside and outside dimensions.

This process removes all burrs, generates a uniform 0.005 to .005 in. radius on the periphery of each exhaust port, maintaining a customer specified microinch surface measurement, in a one-minute cycle. One man services six spindle stations.

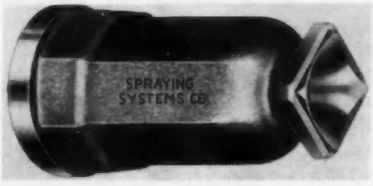
Features of the equipment include a vibrating abrasive media tank, combined with a part spindle which is oscillated radially at a high rate of speed. Fixturing is air-actuated, and can be readily changed to accommodate other components. *Mecha-Finish Corp.*

Circle 54 on postcard for more data

Square Spray Nozzle

EXTREMELY wide projection, and a square spray pattern are two features of a new spray nozzle.

It is designed for installation on spray manifolds where open area is dimensionally limited. The average spray angle of 110 deg provides wide coverage within a short distance

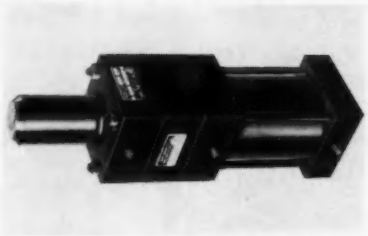


between spray nozzle and work. The square spray pattern on manifold, multiple nozzle installations, permits keeping spray overlap to a minimum while still providing total coverage. Wide angle square-spray full jet nozzles are supplied in capacities ranging from 5.9 to 48 gpm at 30 psi, in choice of male and female pipe connections. *Spraying Systems Co.*

Circle 55 on postcard for more data

Air-Hydraulic Boosters

BOOSTING ordinary compressed air (80 psi) up to 3000 psi hydraulic pressure without the use of any additional power or need for pumps or motors, a new line of air-hydraulic boosters provides an economical, convenient means of stepping up power

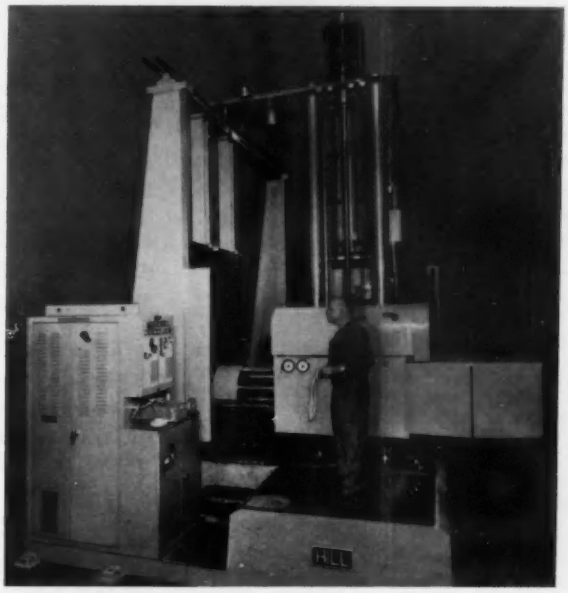


for multi-purpose production uses, according to the manufacturer.

As pressures increase, the seal effectiveness increases with the multiple-lip self-energizing seals that were designed to effect a trouble-free positive seal with minimum friction and maximum efficiency. The simple, compact design of the booster saves space and permits its use for powering such equipment as spot welders, "C" frame riveters, hydrostatic testing equipment, workholding fixtures, bench or arbor presses. *The S-P Mfg. Corp.*

Circle 57 on postcard for more data

Numerically Controlled Machine Handles Work to 10 ft



Sixteen speeds are available on a new numerically controlled jig drilling machine. The drill spindle on this unit is powered by a 15 hp motor. Feed rates on the spindle are up to 120 ipm, and the spindle speed range is 50 to 1500 rpm. Floor space requirements are 12 by 20 ft and the unit is 18 ft in height.

Circle 56 on postcard for more data

A numerically controlled jig drilling machine has been designed for programmed drilling of holes in parts or groups of parts measuring up to 10 ft square.

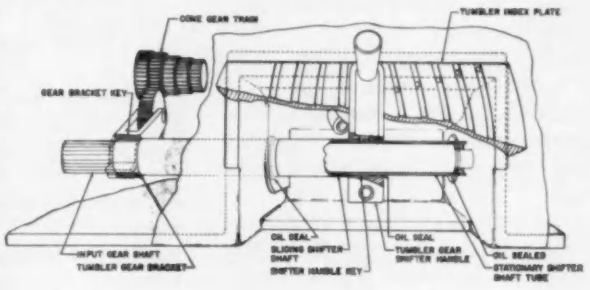
The machine is ideally adapted to the drilling of hole patterns and bolt circles in condenser tube sheets. Condenser tube sheets or vessels longer than 10 ft but within the 10 ft height dimension can be handled on the machine by indexing the part horizontally and floating in the correct zero setting for tape programming. A part 33 ft long can be programmed on one tape.

In this huge new tape-controlled machine tool, the work to be drilled is clamped in a work fixture and held stationary while the head carrying the drill is moved vertically and horizontally to programmed positions for drilling.

A floating zero arrangement included in the *General Electric* Mark II numerical control system enables a number of smaller parts to be clamped simultaneously in the work fixture and accurately drilled under tape control. The control system has decade buttons for manual position settings. *Walter P. Hill, Inc.*

Totally Enclosed Gear Box Is Featured on New Lathe

A new design totally enclosed gear box is one of the features of a new model engine lathe. Sixty separate feeds from 0.0027 to 0.192 ipr, and sixty separate thread changes from 1 to 72 threads per in. are selected by removing the shifting handle to the desired feed or lead shown on the direct reading tumbler index plate. These changes can be accomplished without stopping the spindle. The Nebel Machine Tool Corp.



TUMBLER OPERATING MECHANISM FOR
TOTALLY ENCLOSED GEAR BOX
HEAVY DUTY LATHE MODELS, HD-2013, HD-2516, SD-2516-20, HXB-26/45

Circle 58 on postcard for more data

SAE Summer Meeting

(Continued from page 52)

Mobil Oil Co., Ethyl Corp., E. I. du Pont de Nemours & Co., Inc., and Esso Research & Engineering Co.

It may be significant to point out that the boiling points of TML and TEL are respectively 230 and 390 F.

TML apparently increases the road octane performance of certain base gasolines in low-speed operation, mainly because of its higher volatility and more-uniform distribution.

As illustrative of the speakers' comments in this session, R. H. Perry, Jr., C. J. DiPerna and D. P. Heath of Socony Mobil Oil Co. said their studies had revealed uneven distribution of fuel components (including TEL) to individual cylinders of engines in many cars during wide-open acceleration from low speeds. Therefore the gasoline reaching some of the cylinders was of a much lower antiknock quality than the whole gasoline blend. TML, with its greater volatility, was stated to thus provide superior antiknock characteristics by being capable of getting more readily to all the cylinders.

The Socony Mobil engineers reported that TML is basically a superior material for increasing the octane number of gasolines made by catalytic reforming. With such blends they estimated an increase of three road octane numbers or more would be achieved in 50 per cent of all manual-transmission cars—and an increase of about two road octane numbers in 90 per cent of the world's manual-transmission cars. Further, that in automatic-transmission cars, the gain in most cases would be between one and one-and-a-quarter octane numbers, with an advantage in some cases of two road octane numbers.

The various engineers were careful to point out, however, that TML is not a "panacea." For example, TML was less effective and TEL was the more-effective antiknock with fuel types such as blends of olefinic and paraffinic base stocks. Also, in the presence of high concentrations of compounds which cause loss in antiknock quality of leaded fuels, the loss was found to be greater with TML than with TEL. Consequently the antiknock effectiveness of TML versus TEL apparently depends upon the characteristics of the base fuel.

• Plastic-Clad Metals •

Product developments in plastic-clad metals, along with evidence of their expanded usage, were aired in one of the sessions. Speakers described the products and processes employed by four different companies.

P. E. Roggi and C. E. Kiernan of the Naugatuck Chemical Div., U. S. Rubber Co., discussed the Marvibond process on the basis of seven years' experience. In this process vinyl sheeting is laminated to sheet metal by means of an adhesive. These co-authors indicated that last year the usage of vinyl-metal laminate rose to a volume of 27 million square feet.

G. H. Rendel of the U. S. Steel Corp. described two systems utilized by his company. One is the Marvibond laminating technique mentioned above. The other is a continuous process where liquid vinyl plastisol is roller-coated-applied to metal which has previously been coated with an adhesive primer.

W. G. Cryderman of Kaybar, Inc. made some observations about the method offered by his company. In this instance, the part is shaped and then the vinyl is applied in liquid form by spraying. To achieve texture in the surface, usual practice is to purchase the base metal with the desired pattern embossed in it.

The most unusual process, called fusion bonding, was the subject of a presentation by W. R. Pascoe of Whirlclad Div., The Polymer Corp. The plastic coatings are available in six basic types—cellulosic, vinyl, epoxy, nylon, polyethylene, and chlorinated polyether. They are applied by dipping a preheated part into a bed of finely-divided dry powders which are "fluidized" by air or gas within a tank and which melt and fuse on the heated surface to form a continuous film of plastic. ■

MACHINERY NEWS

(Continued from page 58)

spindle is a 5-in. American standard flanged nose type A-1. The base of the machine contains the motor, clutches, and all of the gearing, with drive to the spindle by a multi-V belt. The machine is being offered in three versions —plain turret lathe, universal turret lathe, and chucking turret lathe.

Numerical control for the company's 1AC single-spindle chucking automatic also was announced. The new tape control system—offered as optional equipment — controls speeds and feeds, cross slide movements, and lengths of cuts. It complements the machine's standard electro-mechanical control system. The tape system employs telephone-type electrical relays — but no electronic circuitry.

Company officials indicated that this optional tape control system for the 1AC is a forerunner of similar controls for the larger W&S 2AC and 3AC chucking automatics, and for the 2AB single-spindle automatic bar machine.

Warner & Swasey has additionally come out with a new two-axis numerical contouring control for its 4-A turret lathe. The combination, known as the 4-A Servo-Tape turret lathe, has tape control of both the carriage and saddle aprons of the cross-sliding-turret machine. Since the auxiliary control functions used in contouring are applied through standard machine components, the tape system does not interfere with use of the machine for conventional turret lathe work. ■

Reports from Machine Tool Builders

(*Continued from page* 49)

four new features and designs."

J. R. Barefoot, president, The Federal Machine & Welder Co.—"Give more lead time to suppliers."

Company Spokesman—"Longer lead time."

Don S. Connor, president, Micromatic Hone Corp.—"Do not repeat the surge of 'rebuild' used equipment. Too costly for everybody."

Company Spokesman—"Place orders farther ahead."

A. W. Blackshaw, sales manager, Hannifin Co.—"If it were possible to spread orders out, it would be helpful. All come at once with minimum lead time."

R. A. Young, general sales manager, Seneca Falls Machine Co.—"Buy sooner to compensate for longer deliveries."

Exposition

The final question was, "Any comments on technological aspects, or possible business impact, or other aspects of The Machine Tool Exposition-1960 which you would like to mention at this time?" Among the many responses were the following:

J. P. Crosby, vice-president of sales, The Lapointe Machine Tool Co.—"Everyone will be showing numerical control in one form or another. Cost reduction capabilities will be the major selling point."

George Gorton, president, George Gorton Machine Co.—"Exposition will point up the research and development carried on by machine tool builders during the past five years."

Company Spokesman—"If business conditions remain generally good, we expect the Exposition will instigate an expanded flow of orders representing plans which have been held in abeyance for the past six months."

Company Spokesman—"Plan to have good size delegations go to the M.T. Exposition to see advances for themselves. Include top management, financial, production, and engineering personnel in your delegation."

G. K. Cassady, general sales manager, Giddings & Lewis Machine Tool Co.—"Expect definite increase in orders, particularly on new designs now being released and shown in prototype form."

Don S. Connor, president, Micromatic Hone Corp.—"Indications are that it will be of considerable stimulus."

S. M. Napp, vice-president Besly-Welles Corp.—"We strongly feel the Exposition will assist us in obtaining a number of machine orders."

R. A. Young, general sales manager, Seneca Falls Machine Co.—"We expect that the Exposition will result in a small spurt of business from those who are holding back."

E. M. Hicks, vice-president, Norton Co.—"This is an opportunity, which comes every five years, to see the tremendous technological progress of the machine tool industry. No metalworking executive can afford to miss this opportunity to find new ways of cutting costs through modernization." ■

The General Services Administration has announced the purchase of more than $1.5 million worth of automobiles and trucks from the Chrysler Corp. and Ford Motor Co. The vehicles will be used by government agencies throughout the country. GSA said 398 Plymouth sedans and 89 Plymouth station wagons were bought from Chrysler for $779,848. Ford will supply 513 light trucks for $875,252. Both companies were low bidders.

The Surgeon General of the U. S. will make a two-year study of the medical effects of automobile and truck exhaust gases on humans. The study was directed by Congress. At the end of two years, the Surgeon General is required to submit a report to Congress on the findings. This is the first step in what eventually may become a federal smog-control law.

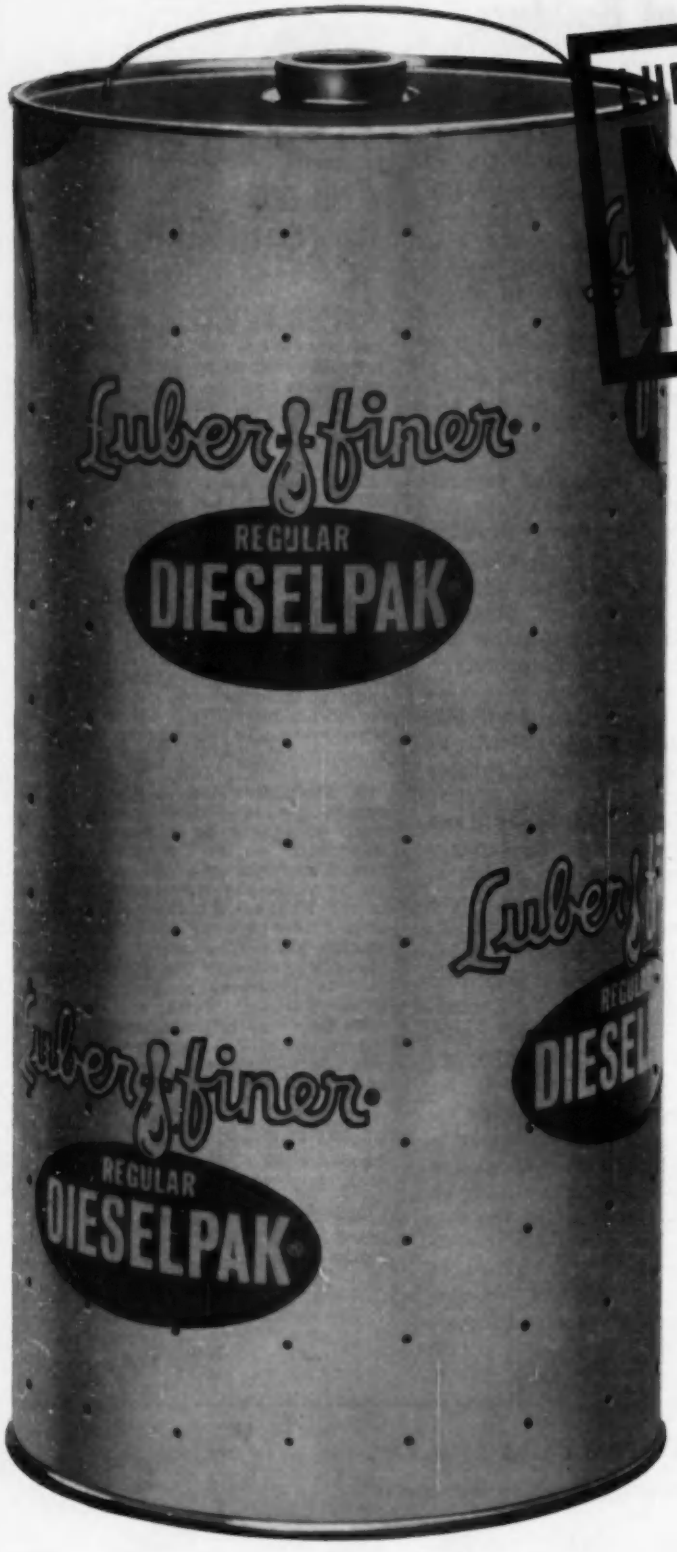
A sharp increase in highway research is needed if the country is to keep pace with an economy "utterly dependent" on its highway system, a scientific group says. A special committee of the Highway Research Board of the National Academy of Sciences says a new highway research program costing $34 million over the next four years is necessary. Study areas would include highways that electronically guide vehicles; traffic safety; better road building materials, and improved maintenance. The studies would be in addition to research expenditures now costing $17 million yearly.

Creation of a limited national driver records clearance program is making headway as Congress drives for an early July windup. A measure to set up a list of drivers who lost their licenses because of drunken driving or involuntary manslaughter cleared the House Commerce Committee in June. In the Senate, Sen. Clifford Case (R., N. J.) is pushing for similar legislation to require the Commerce Dept. to keep a registry of driver revocations and of major traffic violations bytruck drivers.

1960 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	over 33,000 lb.	Total
January	62,211	17,920	1,260	3,080	18,877	5,962	3,148	2,810	115,268
February	70,245	18,989	1,222	2,985	18,348	7,023	3,596	3,530	125,938
March	73,143	19,849	1,265	3,240	18,065	7,849	4,061	3,697	131,169
April	61,711	18,583	1,019	3,326	15,457	6,847	4,011	3,636	114,590
Four Months—1960	267,310	75,341	4,766	12,631	70,747	27,681	14,816	13,673	486,965
Four Months—1959	212,894	70,502	5,435	36,270	49,501	21,506	14,420	13,754	424,282



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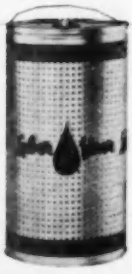

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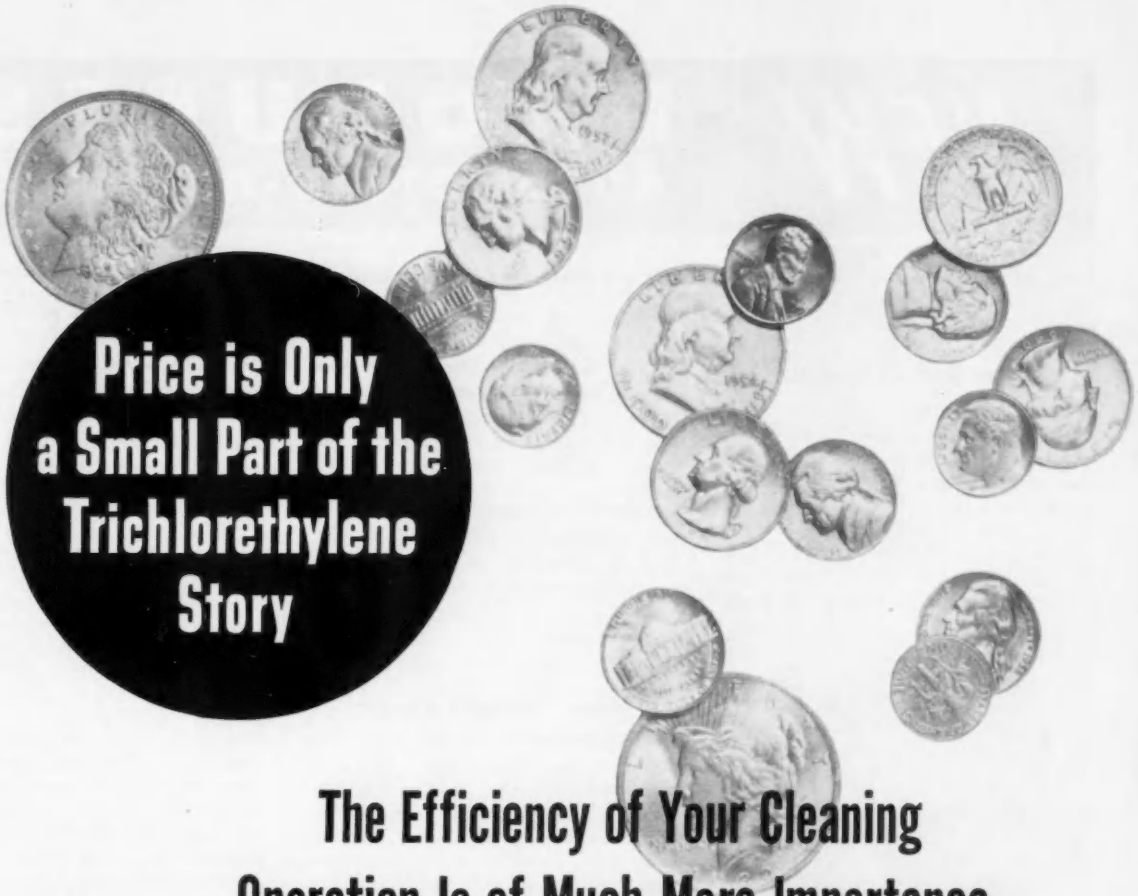

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Detrex engineers have been making such operational studies for more than 30 years. In many, many instances they have set up a program that has reduced solvent consumption by 15% to 25%. They would like to help you.

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- Ultrasonic Equipment
- Industrial Washer
- Phosphate Coating Compounds
- PAINTBOND Compounds
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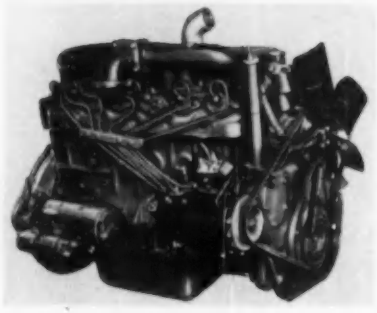
FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

New Diesel Engine

Designed for application on medium-duty trucks, a new heavy duty, high speed Diesel engine has a piston displacement of 301 cu in., is naturally asperated, and delivers 110 hp at 3000 rpm.

The weight of this unit is 902 lb or 8.2 lb per hp. Other features of this line are direct electric starting,



and a simplified fuel system. The bore and stroke of the unit are 3.812 by 4.390, and compression ratio is 18 to 1.

Aluminum alloy dished-top pistons are designed to insure effective conduction of engine heat to jacket coolant. A fully-hardened heavy-duty crankshaft and reinforced crankcase were engineered to contribute to the service life. *International Harvester Co.*

Circle 36 on postcard for more data

New Long Life Battery

A truly industrial-type battery has been developed for the growing genus of light-duty industrial trucks, personnel carriers and other small electrically powered utility buggies.

The battery, called the Exide 3-KCS-9, delivers 9 to 30 pct. more electrical energy than automotive-type batteries, yet is sized physically to substitute for them, according to the manufacturer.

Developed specifically for long power-drain service that electrically powered vehicles demand, the 3-KCS-9 has a predicted minimum service life of four years.

The 3-KCS-9 is an advanced version in miniature of batteries designed to keep heavy-duty electric industrial trucks working through rugged, log shifts without intermittent charging. *Exide Industrial Div., The Electric Storage Battery Co.*

Circle 37 on postcard for more data

New "Dome" Points

A new method of forming and polishing curved ignition contacts is the basis of a new product development called "Dome" points. The manufacturer claims that the curved contact surfaces on these point sets are "mirror-smooth" and absolutely free of any microscopic nicks or grooves.

These nicks and grooves—the by-products of forming curved contacts by ordinary methods—are where dirt and oxidation collect to cause burning and pitting, according to company engineers. By reducing this problem, the company claims to have greatly expanded the life of its points. *Standard Motor Products, Inc.*

Circle 38 on postcard for more data

Speed Nut for Visors

A new speed nut has been designed for retaining sun visors to truck cabs. The new spring steel fastener, which provides adjustable compression on the visor's pivot pin, is attached to the cab panel through two elongated mounting holes which permit a sliding lateral movement of the mounting feet during adjustment. A 5/16-in. diameter pivot rod is then inserted into the barrel of the fastener and the adjustment screw is tightened to the desired degree. A decorative cap covers the assembly.

Two permanent locks—the inward thread lock of the speed nut impression and the compression spring lock on the pivot rod—set up forces that secure the adjustment screw in set position and prevent vibration loosening. *Tinnerman Products, Inc.*

Circle 39 on postcard for more data

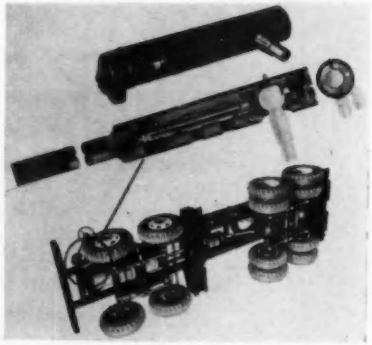
Versatile Hose

Three different components make up a new industrial hose that is reported applicable to various phases of manufacturing. It may be employed in pressure paint spraying operations, fluid handling, vacuum lines, and catalyst and plasitol handling. The manufacturer reports this hose was subjected to over 5 million 90 deg twists with no effects. *Samuel Moore and Co.*

Circle 40 on postcard for more data

Power Steering Valves

A new power steering valve has been designed for application on heavy-duty vehicles such as high-speed highway trucks, off-highway



trucks, truck crane chassis, industrial loaders, and material handling equipment.

This manufacturer is the originator of the "divided linkage" or "two piece system" of power steering applications, according to their report. *Garrison Mfg. Co.*

Circle 41 on postcard for more data

New Exhaust System

A new ceramic-coated exhaust system reported to be virtually impervious to corrosion will be introduced with all 1961 model Ramblers.

Both the muffler and tailpipe are coated with the ceramic through a process conceived originally for military jet engines.

In describing the new process is applied by dipping mufflers and tailpipes so that both outer and inner surfaces are coated. The coating then is fused to the metal in a continuous furnace at a temperature of 1500 deg F.

After the ceramic process is completed, a layer of asbestos insulation and the outer cover are applied to the muffler. The zinc-coated cover is also corrosion resistant.

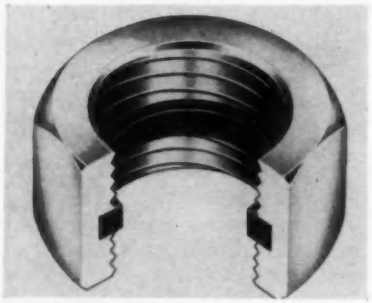
In the three years of research to perfect the ceramic-coated exhaust system, more than 5000 pilot mufflers were produced. Special laboratory tests using the same acid condensate as found in mufflers made possible accelerated tests to provide comparative durability data. *American Motors Corp.*

Circle 42 on postcard for more data

Self-Locking Nut

The development of a new self-locking nut has been announced, and will be available in September in all standard and commercial sizes. It has been named the "J-Lok," and is suitable for standard or high temperature operations.

The new J-Lok, which has an internal locking ring, can be used either side up for automatic assembly and is good for dozens of reuses. For standard applications the new nut is made with an internal locking ring of



delrin or polypropylene; both are flexible, resilient materials. For high temperature applications, the new J-Lok is made with an internal, spring steel locking ring. *Jacobson Nut Mfg. Corp.*

Circle 43 on postcard for more data

Solid Lubricants

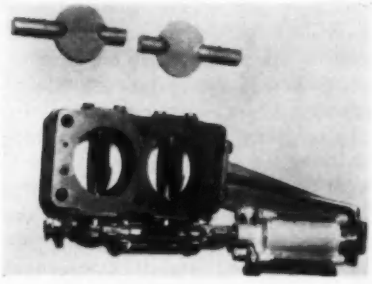
A solid lubricant with as much as 20 times the normal load bearing capacity has been developed by the addition of various inorganic sulfides to the well known lubricants molybdenum disulfide or tungsten disulfide.

According to the manufacturer solid lubricants make possible the miniaturization of numerous devices, since they can be used in high temperatures. *General Electric.*

Circle 44 on postcard for more data

New Automotive Brake

The incorporation of stainless alloy castings into an auxiliary truck braking device has solved problems of warping, leaking, cracking, corrosion and excessive fabrication costs—which previously made this unique design impractical, according to reports from the manufacturer of this unit. This compression brake is de-



signed for use on diesel and gasoline engines to provide increased safety and reduce operating and maintenance costs.

The braking device is a safety feature which operates independently of air or mechanical brakes. Braking action and butterfly valve position are controlled by air or a mechanical overide and lever. When the truck descends a grade, the butterfly valve automatically closes to begin pressure build-up when the foot throttle is released.

Bolted directly to the manifold or welded compactly into the exhaust pipe between the manifold and muffler, the brake restricts the exhaust and builds up a back pressure of 40 to 50 psi in the exhaust manifold. By thus converting each cylinder into a low-pressure air compressor, the braking device introduces a retarding force against piston head areas at least equal to the engine's horsepower output. *The Power Brake Equipment Co.*

Circle 45 on postcard for more data

Sleeve Valve

A valve, which operates on the on-off principle, has been developed for application in any operation where controlling, single-acting, spring-re-

turn cylinders automatically will speed production.

This unit is compact in design, with measurements of 2¾ in. long by 1⅛ in. in dia., and can be installed in any position or place in a production line. It can be placed on the cylinder or the machine itself. *Airmatic Valve, Inc.*

Circle 46 on postcard for more data

New Roller Chain

A new type of roller chain is expected to result in substantial cost savings for operators of heavy construction equipment.

According to the manufacturer, this newly developed steel roller chain is expected to last up to 30 pct longer in heavy duty service than existing offset sidebar chain of comparable dimensions.

The chain, bearing the trade name Tuf-Flex, will deflect four inches either way from its normal plane, and will twist 8 deg in four feet of chain to accommodate misalignment between sprockets resulting from the twisting of the machine frame as it travels over rough terrain. Greater joint clearances also reduce chain stiffness after periods of idleness and exposure to weather.

This chain is designed for use on construction equipment including crawler drives on power excavators, cranes, drum drives on concrete transmit-mix trucks, and for power transmission on road pavers and trenchers. *American Steel Foundries.*

Circle 47 on postcard for more data

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

METALS

Further Cuts in Production of Steel Expected Before the Start of an Upturn. Aluminum Output Up; Deliveries Down.

By William F. Boericke

Steel Operating Rate Declines

The decline in the steel operating rate since February has been one of the most drastic on record. From 95 per cent it slid off to near 60 per cent in early June, to recover to about 62 per cent by the middle of the month. It's doubtful if it can hold even this figure. A combination of continued inventory trimming and mass vacations in July are expected to bring further production cuts that may reduce the rate to 50 or 55 per cent before the start of an expected upturn in August. By September it should rise to 70 per cent, then average 75 to 85 per cent for the fourth quarter.

The chairman of U. S. Steel is a bit more optimistic and believes the decline may halt above 55 per cent. He looks for an end of inventory cutting in August. Consumption should support 70 to 75 per cent of the steel making capacity.

Inventories Still Being Reduced

It must now be regretfully admitted that most students of the steel industry were woefully wrong in expecting that inventory building would be maintained until at least the middle of June. They thought inventories would be built up to 18 to 20 million tons. They failed to visualize the terriffic rate at which the industry would operate after the strike, and that consumers would realize all too quickly there was no need to stockpile steel with plenty to be had for the asking. Thus, instead of building inventories, the reverse took place in March and accelerated in May. At present, according to *Iron Age*, steel users are still liquidating inventory at the rate of one million tons a month. This might continue until it reached about 14 or 15 million tons. Buyers seem determined to stock less steel than ever before.

Consumption Better Than Indicated

Nevertheless, actual steel consumption is probably better than the operating rate would indicate. Most product lines are running about the same rate as last year. There are exceptions. Steel shipments to the oil and gas industry have declined sharply both to warehouses specializing in oil country goods and direct shipments to consumers. In less degree smaller shipments have been made to shipbuilders, agriculture, and electrical equipment makers. Steel buying for July has averaged under the amount ordered in June. The collapse of the Summit Conference failed to stimulate buying interest. But a cheerful note has been sounded by the Business & Defense Service Administration which points out that steel exports rose and imports declined in April. On balance, however, imports still exceed exports although this may be near an end.

Price Cuts at Service Centers

Indication of the extremely competitive market are the price cuts announced at service centers which are expected to result in an average reduction of $3 to $4 a ton in the price of warehouse steel. This will be of special benefit to the small buyer.

Market weakness dropped the composite price of steel scrap to $31.50 by mid-June, the lowest since April, 1958. Mills are not anxious to use dealer scrap. Export demand helps to hold the price in coastal areas. Demand is poor for merchant wire and sales of pipe are below normal. Structurals are in fair demand. Tin plate and galvanized are the strongest products but some tapering off in demand seems evident. Stainless steel is weak.

Aluminum Output Up; Deliveries Decline

While primary aluminum production continues at an all-time high rate with the industry operating at about 86 per cent of capacity, domestic shipments give less reason for cheering. They have slipped about 4 per cent below the comparable 1959 period in the first six months of this year. Like steel, inventory cutbacks are blamed for the slower tempo of buying. The slack between rising production and lower domestic demand has been absorbed by a high export rate. First quarter exports registered a new high, almost three times the tonnage for the first period of 1959. However before this leads to undue optimism, it should be recalled that probably a good part of these exports were consigned to building up inventories of the foreign affiliates of U. S. domestic producers and does not necessarily mean that all the exports went into consumers hands.

Inventories Reduced

Consumer's inventories in this country are believed to be in a downward trend while producers inventories are quite certainly at a relatively low level. At the start of the year fabricators were estimated to have a peak of two months supply of metal in stock. This has since dropped about 10 per cent. But producers ingot stocks have dropped 30 per cent

(*Turn to page 73, please*)

Circle 124 on Inquiry Card for more data ——→

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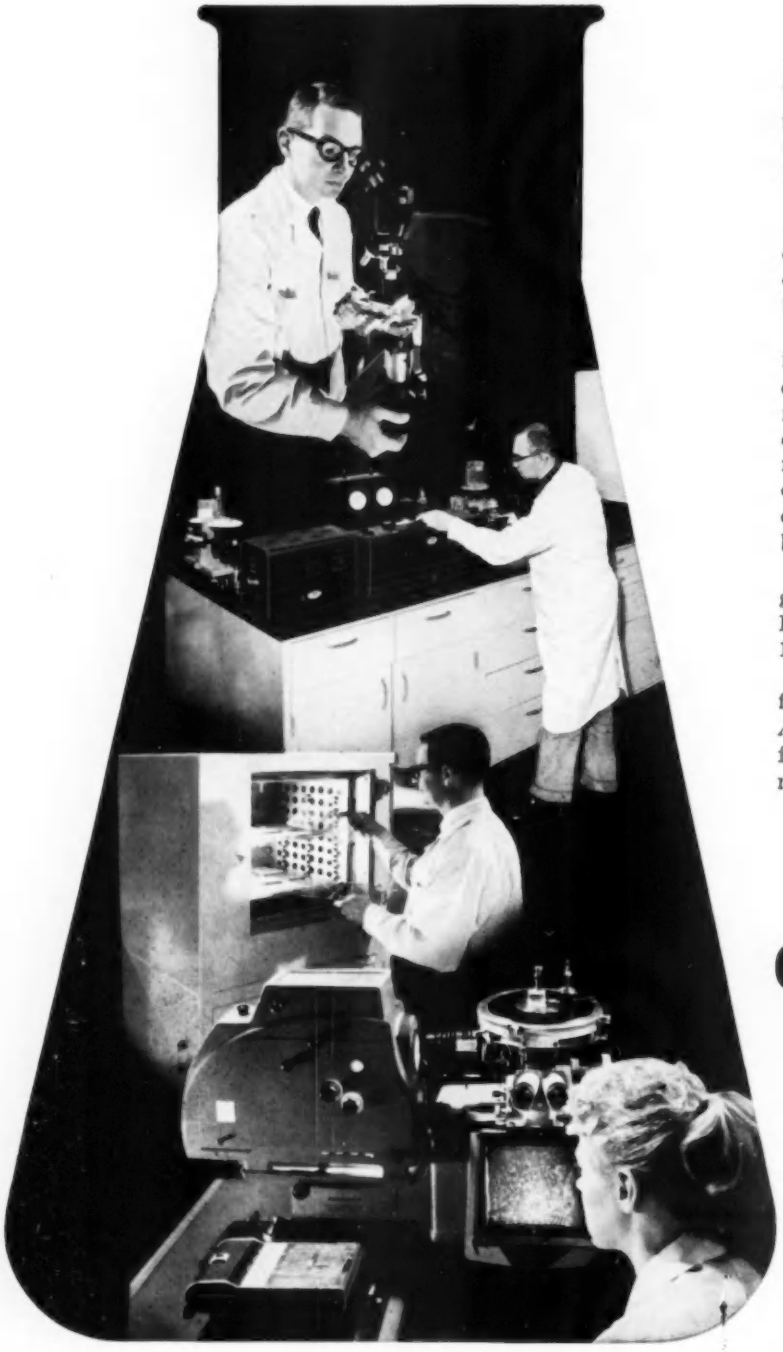

The 60's! Exciting, startling, enriching! Years of new advances in industry, new milestones in science, new secrets of power unlocked, a completely new standard of living for us all.

Globe-Union looks forward to the 60's — its challenges, its rewards. With a recently completed ultra-modern research center, Globe is confident of the major role it will continue to play.

Already, Globe's new technical center is carrying on advanced studies in electrochemical systems and thermodynamic reactions through x-ray spectroscopy, radiography and microscopy. In the new radio-isotope laboratory, tracer amounts of radioactive isotopes expose the course of electrochemical corrosion reactions in battery components.

A raw materials test laboratory integrates Globe's quality control program. Here incoming raw materials from Globe's 16 battery plants are precision tested.

Yes, in the 60's Globe will build even finer batteries than the best of today. *And beyond the horizon?* Perhaps new fuel cells, new electrochemical systems, new power sources!

Wonderful years, these 60's!

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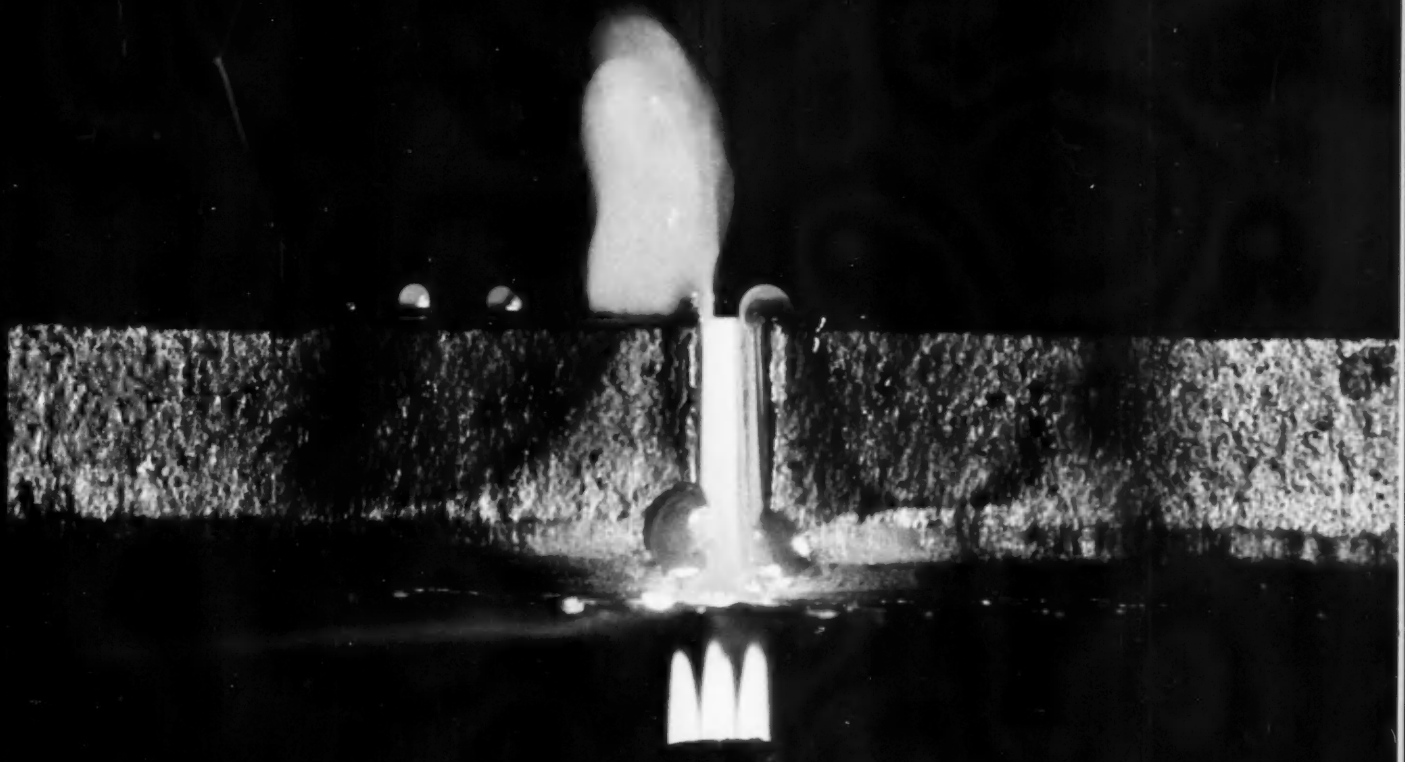
MIDLAND



Research and Development at Work

Trial by fire! New Midland materials are safety tested at fantastic temperatures . . . tortured at blast furnace intensity far beyond safety requirements to produce the world's safest brake systems.

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AIR BRAKES • AIR COMPRESSORS • AIR CONTROLS • VACUUM POWER BRAKES • DIE CASTINGS • CONSOLIDATED TRANSPORTATION EQUIPMENT

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Annealing: Its Uses with Alloy Steels

Broadly speaking, the primary purpose of annealing is to soften steel and make it more workable. Annealing, as applied to alloy steels, may be defined as a process that heats above, and furnace-cools through, the critical range at a controlled, specified rate of speed; or that heats to a point within, and furnace-cools to a point below, the critical range. In either case, the choice depends upon the structure and maximum hardness desired.

The first method produces a lamellar pearlitic structure, while the second creates a spheroidized condition. These will be discussed separately in the following paragraphs:

(1) *Lamellar pearlitic structure.* It should be mentioned at once that this structure can be obtained both as described above and by a modified method known as isothermal annealing. In the isothermal process, the steel is heated above the critical temperature (austenitized), then transformed at a predetermined temperature, which depends upon the analysis. This operation requires two furnaces or salt baths —one for austenitizing, one for transformation.

Lamellar pearlitic structures are generally associated with machinability in carbon ranges from 0.20 to 0.60 pct, provided the hardness does not exceed the optimum maximum Brinell numeral. This is especially true where critical tooling is involved. It is a very versatile structure, as it gives best results in such operations as broaching, tapping, threading, deep drilling, boring, milling, and tooling as applied on single- and multiple-spindle bar automatic machines.

(2) *Spheroidized structure.* There are two general fields of use for this type of structure when alloy steels are employed. In the low and medium carbon ranges, spheroidization is necessary for cold-shaping operations, such as heading, extruding, drawing. In the higher carbon ranges (over 0.60 pct), it is mandatory where machining is involved, because it tends to lower the hardness of the steel.

If you want more details about these and other uses of annealing, and the results to be expected, by all means consult with our technical staff. And when you need alloy steels, Bethlehem can offer the full range of AISI standard grades, as well as special-analysis steels and all carbon grades.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Circle 127 on Inquiry Card for more data

METALS

(*Continued from page* 68)

in the same time.

There seems to be little chance that the price of pig will be increased when the August wage hike goes into effect. Because of high competition within the industry as well as a lower price quoted abroad for the metal it seems likely that producers will absorb the increased labor cost which does not constitute so large a cost item as for copper or zinc.

Aluminum-Apex Merger Abandoned

An interesting development during the month was the announcement by Aluminium Ltd. that it would abandon the plan to purchase the assets of Apex Smelting Co., a major U. S. producer of secondary aluminum. The reason ascribed was indicated disapproval by the Justice Department. This would appear to end the effort of the big Canadian producer to break into the U. S. fabricator market with its own controlled facilities.

Slow Sales of Copper

While copper sales have been slow in this country, they have been very good abroad. Undoubtedly this has been a main reason for the strength in the copper price which might otherwise have declined from the 33 cent level that has been maintained so long by smelters and producers alike. Domestic business in the brass industry has been very slack. Consumers apparently are still comfortably fixed with their inventories, and it seems unlikely they will be buying much until fall. Competition remains very keen especially from abroad.

The London price of copper has been firm. After falling to the equivalent of 29½ cents a pound, it recovered to about 30½ cents for spot metal. Backwardation, or the premium paid for spot over 90 day delivery, has practically disappeared. It has been as much as 2½ cents a pound. But the mercurial copper price in London is far from being settled. Fears are expressed that the supply of the metal from the Belgian Congo may be interrupted after June 30 when that country gains its independence. Trouble might extend into Rhodesia. These two countries account for about 24 per cent of the world's copper and are major sources of supply for Europe. No doubt some of the European buying has been for building up a supply in case of interference with imports.

Effect of Chilean Earthquake

The tremendous damage in Chile from the earthquakes is another unsettling factor on the copper market. It seems likely that the American - owned copper mines there will be called upon to contribute substantially for rehabilitation costs. This could result in increasing production costs and make it less likely that a price reduction would find any favor, either from the Government or from the companies. The whole situation is so unsettled that any projection of a price is purely guess work. Without work interruption copper would be in oversupply. There's no doubt about this, and it has been frankly recognized by executives of the major copper producers, who seem prepared to put cutbacks on output into effect, to hold the price at not less than 30 cents a pound. But the uncertainties in the African and Chilean situations will probably postpone any action for some time. About all that can be said is that the present 33 cent price is likely to hold for some time ahead and reports that the smelters have sold at less than this price have been denied.

Zinc Statistics Regarded Bearish

If the May figures from the Zinc Institute reflect the situation adequately, the zinc industry had a discouraging month. Unsold zinc stocks at the smelter's plants increased over 17,000 tons to total 165,000 tons on June 1, and brought stocks to the highest levels in six months. Most of the increase was a Special High Grade stocks, which climbed nearly 14,000 tons, reflecting poor demand from the diecasters who had bought heavily before the April price rise was announced. No improvement is expected until the automobile makers start on the 1961 models, which would mean August or September.

Shipments to the galvanizers held up better, although the rate has started to slip with the slump in the steel operating rate. The call from the brass manufacturers has been very light because of very slow business in the foundries. Overall shipments during May fell to 62,000 tons, the lowest since last October and the third consecutive monthly decline.

However, the trade is of the opinion that actual consumption exceeds shipments measurably. A leading producer declared that orders had recently been received that countermanded previous requests for deferment, and asked that shipment be traced to insure speedy delivery. This suggests that zinc supplies in the hands of consumers may be pretty low.

In contrast with business in this country, zinc demand is excellent abroad. The London price has held steady at the equivalent of 11¼ cents for a long time and the price for 90 day delivery has been a trifle higher, indicating there is no belief that zinc will sell lower in the three months ahead. In this country a mine-mill strike at Bunker Hill and the American Smelting Mines in Idaho has shut down all production of zinc and lead in this area for what may be an indefinite period. It seems likely that smelter production will be affected accordingly to some extent. ■

AUTOMOTIVE INDUSTRIES . . .
is your News Magazine of Automotive and Aviation
MANUFACTURING

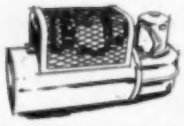
When you're choosing a protective coating...

HOW HOT IS YOUR HOT?

A Nose Cone Gets Hot

When conventional organic finishes were used in Chrysler Redstone Missile tests, they ignited and disintegrated under simulated re-entry conditions. Sicon survived because it possessed the inherent heat resistance to meet performance requirements. This has been confirmed in large scale tests and actual missile firings.

A Truck Heater Gets Hot



A porcelain type coating used on a truck heater failed because it could not stand the thermal shock of rapid heating and cooling. The same heating (550°-600°F.) and cooling left Sicon's film integrity unaffected.

A Tractor Engine Gets Hot

A farm equipment manufacturer used a bright organic red color on their standard equipment. The coating on the engine parts, which were subjected to high temperature, quickly decomposed. Midland engineers developed a matching bright Sicon Red which retained its color and gloss and protected the hot spots on the engine.

How HOT is your HOT?

Sicon possesses the flexibility of ordinary organic finishes and the heat resistance of ceramic coatings—up to 1000°F. in black or Aluminum; up to 550°-600°F. in decorative colors. Upon inquiry a sample Sicon formulation for testing your "hot" requirements will be prepared at no obligation. Send details of your "hot spot" problem today to Dept. G-36.

Sicon®

HEAT RESISTANT FINISH

A Silicone Product of

MIDLAND

INDUSTRIAL FINISHES COMPANY

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ENAMELS • SYNTHETICS • LACQUERS • VARNISHES

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SPI Automobile Conference

(*Continued from page* 45)

This construction would permit the instrument panel to absorb a great amount of shock. The instruments could also be made safer by covering as outlined above (knobs).

Side panels: A new type side panel will be presented to the automotive industry this year. It will have a vinyl foam body with a skin of vinyl as a covering. This material will be both attractive and serve as a shock absorbing covering over the inside of the door. Another type of door side panel could incorporate a rigid urethane foam as a base. A thin skin of flexible urethane could then be adhered to the rigid foam and a vinyl skin adhered to the flexible urethane. This type of panel would provide insulation, light weight and excellent shock absorption.

Plastic foam can help lighten and strengthen the floor of the new welded bodies. It is possible to use a sandwich construction incorporating light sheet metal (with reinforcing ribs) plus rigid urethane, polystyrene or polyethylene foam. Similar construction has been used on truck bodies for several years.

An appreciable amount of work has been done using polyurethane and vinyl foam for windlace.

There is interest in spraying either polyester or polyether foam for head-liners. The skin would be tough, light weight and resistant to abrasion. Trunk and hood lids could be made using thin sheet metal sandwich construction or by merely backing-up the metal with rigid urethane, polystyrene or polyethylene foam.

Body sealing is a real problem. Rigid, semi-rigid or flexible urethane, as well as vinyl foams indicate a good potential for this application. An interesting development is the work being done incorporating tar in the foam. The excellent sound deadening, adhesion to metal, heat, cold and solvent resistance of urethanes make their use highly desirable.

Urethane, and polyethylene foam will be increasingly used for gaskets to replace molded rubber around vents and windows.

Polyethylene foam will see increasing usage as gaskets for under the hood applications.

Experimental work is being done on the use of polyether foam in oil filters either as the filter itself or as a sealer at the ends. One automotive manufacturer is exploring the use of semi-rigid urethane as an insulator on the fire-wall.

Another application worthy of consideration is the technique for molding urethane skins over urethane foam. This covering would provide superior resistance to abrasion and would be firmly bonded to the foam.

Spraying fenders, bumpers and quarter-panels with vinyl foam for packaging is rapidly approaching production. The vinyl foam covered parts will be shipped to depots and garages all over the country where they need only to be stripped of the foam and washed with solvent. The only problem facing the industry is one of cost, and this is very close to being solved.

Styling Advantages With Cellular Plastics

By Rudolph Farara

General Motors Styling

GENERAL MOTORS CORP.

To elaborate on a serious existing problem of my own—the automotive industry has need for better seating. The trend toward lower lines of the modern automobile has created space problems that will require new methods of construction. We need seat construction that will provide the comfort, light weight and flexibility of design to permit the stylist and engineer the freedom to change as conditions and needs vary. The compact car has

(*Turn to page* 82, *please*)

New Super-Roadpacker is world's highest capacity vibratory compactor. Shown in operation on Ohio Interstate Route 1, it uses two 15-foot rows of vibrating shoes to compact roadbuilding materials at variable speeds best suited to the job.

vibration/shock/noise control for construction colossus

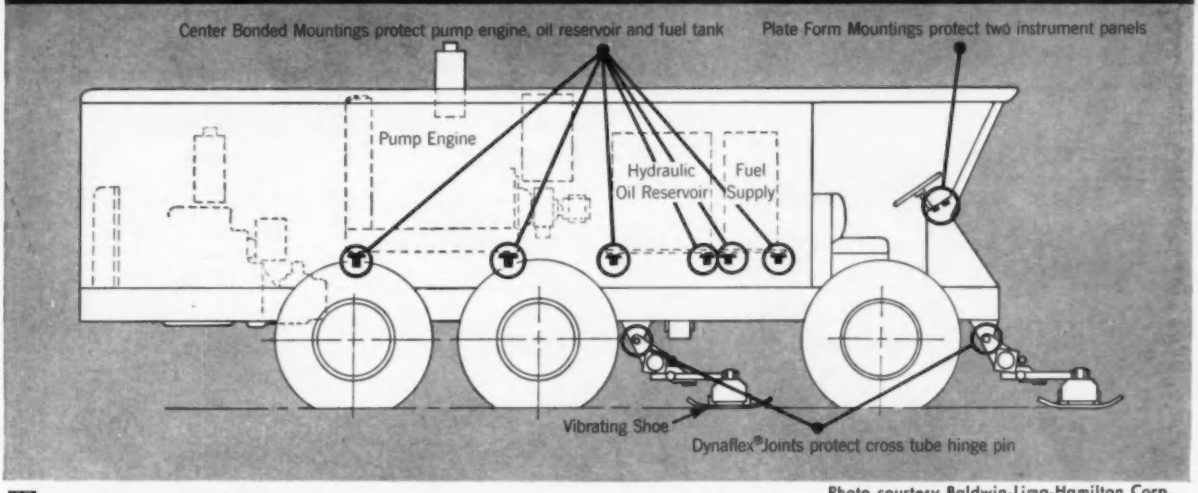
Center Bonded Mountings protect pump engine, oil reservoir and fuel tank
Plate Form Mountings protect two instrument panels
Pump Engine
Hydraulic Oil Reservoir
Fuel Supply
Vibrating Shoe
Dynaflex® Joints protect cross tube hinge pin

Photo courtesy Baldwin-Lima-Hamilton Corp.

This roadbuilding giant compacts soils by delivering 2200 blows per minute through its 12 vibrating shoes. The resulting disturbances could seriously damage vital components of the Super-Roadpacker. But LORD Mountings and Joints with controlled flexibility prevent damage by isolating vibration, attenuating shock and reducing wear.

Once again the benefits of engineered protection against shock and vibration are realized through better performance, longer service life and less maintenance.

Designers of equipment exposed to harsh jolts, vibration, distortion or misalignment can upgrade product quality with LORD vibration/shock/noise control. Proved benefits result when you use LORD elastomeric units at critical points—engines, radiators, batteries, hoods, cabs, seats, instrument panels, fuel tanks, transfer cases, load equalizers, radius rods.

Utilize LORD capabilities to solve your problem. Contact your nearest LORD Field Office or the Home Office, Erie, Pa.

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New York City · BRyant 9-8042
Paramus, N. J. · Diamond 3-5333
PHILADELPHIA, PA. · PEnnypacker 5-3559
SAN FRANCISCO, CAL. · EXbrook 7-6280
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"In Canada—Railway & Power Engineering Corporation Limited"

LORD MANUFACTURING COMPANY · ERIE, PA.

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• • INDUSTRY STATISTICS • •

By Marcus Ainsworth
STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Vehicle Make	Weeks Ending June 11	Weeks Ending June 4	Year to Date 1960	Year to Date 1959
PASSENGER CAR PRODUCTION				
Total—American Motors Corp.	11,798	9,661	245,463	196,049
Chrysler	1,788	1,526	43,674	39,966
De Soto	165	250	15,168	28,171
Dodge	10,614	8,523	208,386	87,282
Imperial	406		7,940	10,813
Plymouth	4,841	3,887	134,602	227,780
Valiant	6,600	6,029	134,706	
Total—Chrysler Corp.	24,414	20,215	544,476	394,012
Comet	4,697	4,068	64,249	21,884*
Falcon	10,647	8,934	236,031	
Ford	19,090	11,152	518,634	750,109
Lincoln	256	219	10,503	14,985
Mercury	2,594	1,716	83,981	75,266
Total—Ford Motor Co.	37,284	26,089	913,398	862,223
Buick	5,572	4,835	146,951	131,513
Cadillac	3,433	2,743	80,963	81,293
Chevrolet	35,888	32,175	875,842	802,704
Corvair	1,646	2,832	136,026	
Oldsmobile	7,559	5,995	193,808	205,617
Pontiac	9,272	8,201	229,629	222,253
Total—General Motors Corp.	63,370	56,781	1,663,219	1,443,380
Total—Studebaker-Packard Corp.	2,557	2,554	58,318	82,568
Checker Cab	134	175	3,683	2,839
Total—Passenger Cars	139,557	115,475	3,428,560	2,981,071
TRUCK AND BUS PRODUCTION				
Chevrolet	7,112	6,753	219,481	193,310
G. M. C.	2,334	1,807	54,017	42,613
Diamond T	49	60	1,392	3,099
Divco	100	80	2,112	1,748
Dodge and Fargo	486	1,447	36,586	39,391
Ford	7,597	5,941	179,591	161,366
F. W. D.	17	12	499	450
International	2,661	2,213	63,113	68,830
Mack	378	196	6,824	8,047
Studebaker	387	474	7,484	6,378
White	397	289	8,914	9,214
Willys	3,297	3,024	69,898	55,617
Other Trucks	85	80	1,979	1,818
Total—Trucks	24,900	22,356	651,881	591,881
Buses	81	78	1,848	1,368
Total—Motor Vehicles	164,518	137,909	4,082,289	3,574,320

*—Edsel production.

NEW FOREIGN CAR REGISTRATIONS

APRIL

1960		1959	
Volkswagen	14,040	Volkswagen	9,729
Renault	2,483	Renault	6,741
Opel	2,627	English Ford	4,088
English Ford	2,395	Opel	3,861
Fiat	2,276	Simca	3,595
Austin Healey	1,849	Fiat	3,497
Triumph	1,748	Hillman	2,558
Simca	1,479	Triumph	2,194
M. G.	1,477	Vauxhall	2,139
Peugeot	1,326	Volvo	1,810
All Others	12,583	All Others	13,503
Total	48,283	Total	53,715

FOUR MONTHS

Volkswagen	52,294	Volkswagen	32,512
Renault	27,396	Renault	23,438
English Ford	10,941	English Ford	14,400
Opel	10,383	Simca	12,400
Fiat	8,753	Opel	12,169
Simca	5,941	Fiat	11,665
Triumph	5,398	Hillman	9,099
Austin Healey	5,239	Vauxhall	7,210
Vauxhall	5,040	Triumph	6,944
Hillman	4,694	Volvo	6,170
All Others	45,702	All Others	43,752
Total	181,781	Total	179,752

TRACTOR SHIPMENTS

WHEEL TYPE

Hp Ratings	April	Four Months
9-29 belt hp	2,242	15,569
30-34 belt hp		
35-39 belt hp	2,212	10,010
40-49 belt hp	4,035	14,910
50-59 belt hp	4,544	18,198
60 belt hp and over	1,918	11,177
Total	14,951[1]	69,864[2]

TRACK LAYING TYPE

20-59 net engine hp	793	3,622
60-89 net engine hp	407	1,456
90-129 net engine hp	413	1,462
130 net engine hp and over	910	3,613
Total	2,523[3]	10,153[4]

1—Valued at $31,785,000
2—Valued at $150,799,000
3—Valued at $30,512,000
4—Valued at $117,772,000

1960 NEW REGISTRATIONS*

Arranged in Descending Order According to the Four Months, 1960 Totals

NEW CARS

Make	April 1960	March 1960	April 1959	Four Months 1960	Four Months 1959
Chevrolet	168,787	158,420	135,977	554,608	459,718
Ford	135,369	125,367	134,848	476,289	457,473
Plymouth	45,653	42,906	40,200	149,272	113,728
Rambler	42,152	38,336	34,046	134,252	104,491
Pontiac	42,149	36,317	39,103	132,748	124,334
Oldsmobile	34,200	31,532	36,737	116,234	124,664
Dodge	36,579	33,063	14,107	115,779	42,157
Buick	25,330	22,852	24,717	87,605	89,952
Mercury	14,527	14,563	14,548	54,404	49,706
Cadillac	14,019	14,081	14,014	51,647	50,905
Studebaker	10,664	10,794	12,843	38,360	43,777
Chrysler	7,405	7,381	6,185	26,589	19,010
Comet	15,148	5,192		20,340	
De Soto	2,685	2,853	4,460	10,284	14,219
Lincoln	1,909	2,090	2,803	8,554	10,497
Imperial	1,406	1,500	1,676	5,787	5,920
Misc. Domestic	1,020	1,112	435	3,717	1,854
Foreign	49,283	50,310	56,223	181,781	196,014
Total—All Makes	647,267	596,669	574,922	2,168,250	1,918,419

NEW TRUCKS

Make	April 1960	March 1960	April 1959	Four Months 1960	Four Months 1959
Chevrolet	31,944	32,579	32,336	106,439	106,028
Ford	28,309	25,484	26,491	49,003	85,803
International	11,289	9,949	10,829	36,840	29,454
G. M. C.	8,588	7,343	6,817	25,061	22,784
Dodge	4,556	4,259	4,996	14,468	18,196
Willys Truck	1,853	1,838	1,724	6,417	5,678
White	1,381	1,325	1,523	4,966	4,777
Mack	1,091	1,064	1,570	3,875	4,602
Willys Jeep	957	941	849	3,095	2,686
Studebaker	486	297	632	1,048	2,067
Diamond T	272	252	209	927	835
Brockway	93	119	89	390	346
All Others	4,190	4,157	3,898	14,909	13,191
Total—All Makes	95,009	89,627	91,963	312,458	296,447

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

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At the Udylite Load Bank Test Center your new rectifier must pass the most rigorous of inspections before you're even allowed to place it in service. *Every* Udylite rectifier must pass these tests—being made to meet highest product-in-performance standards at *Full Load Capacity*. The tests, run on specially developed equipment, minimize the element of human error and guarantee you finest possible manufacture. Here's what you can count on:

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AIRBRIEFS

By R. RAYMOND KAY
PACIFIC COAST EDITOR

Space Leadership

Nuclear propulsion is the key to space leadership. That's the opinion of Max W. Hunter, assistant chief engineer, space systems, Douglas Aircraft.

We must develop a high-thrust nuclear engine. That's the best answer to the problem of really efficient space exploration.

"The nuclear rocket engine may become the first truly acceptable space engine. It would permit exploration of our solar system in a way similar to the great frontier expansions that have occurred on this planet," Mr. Hunter believes.

Multi-stage chemical rockets are very costly both to build and to recover for re-use. We need a single-stage nuclear device that's completely re-usable.

Reduced Defense Spending?

Peaceful exploration of space may eventually replace defense spending. That's the prediction of William B. Bergen, president, The Martin Company, to the National Industrial Conference Board.

Alert leaders of America's aerospace industry not only would welcome universal disarmament, but survive in good shape.

Of course, Mr. Bergen says, those contractors who are 100 per cent in development and production of weapons systems would lose such business. But they wouldn't be as badly off as they might expect.

Why? Many defense industry leaders prepared years ago for the transition from manned aircraft to missiles. Now, they're probing the frontiers of space with their intercontinental ballistic missiles and scientific exploraton rockets. They're in a good position to play a leading role in man's conquests into space. They have the know-how.

Mr. Bergen believes that, when and if the U. S. can quit its mammoth spending for defense, it will turn right around and make the same investment — and more — in space exploration for peaceful ends.

"You'll see this country's space budget expand by at least as much as its defense budget declines. It will do so because our communist competition also has begun probing the unknown reaches of space. This is a race that no nation, which hopes to retain its leadership in world affairs, dares abandon," Mr. Bergen says.

Employment in Aerospace Industry

You hear a lot of talk of the changing nature of the aerospace industry. Well, it's not just talk.

Take a look at the employment figures. They prove that the industry is converting from volume to short production runs of highly sophisticated weapons.

Peak employment since World War II was in 1957 with 861,700 workers. Today only 683,200 workers are on the payrolls. That's a 22 per cent drop in three years.

From here on out, the aerospace companies will need only highly skilled production workers, engineers, and scientists.

Transporting Rocket Boosters

How to transport eight-story-high rocket boosters from factory to launch pad? It's a perplexing space-age problem.

Goodyear Aircraft believes it has a solution—a non-rigid airship.

The lighter-than-aircraft experts at the company say that modern airships could land practically at tne door of a rocket booster factory. It would clasp a giant 40-ton booster beneath its huge envelope and deliver it to a launch site anywhere in the U. S. or overseas.

"Use of the airship would not have to be confined to the hauling of boosters," Goodyear Vice President R. W. Richardson says. "Transportation containers could be devised to permit shipment of a variety of heavy-tonnage items to launch sites."

European Designs

Could a new trend be starting? U. S. planemakers are going abroad for new models rather than spend huge sums to develop their own.

Douglas Aircraft made the first deal. One of its California plants will build Sud Aviation's (France) twin-engine Caravelle transport for sale in the U. S.

Right now, both Boeing and Convair are talking about building a Hawker-Siddeley model here. The British firm has a short-to-medium range aircraft. It's a three-engine job to be test flown in 1962—and ready for the airlines in 1963.

This jetliner will carry 80 passengers and cruise at 585 mph. Several U. S. flaglines are interested in this craft.

The industry believes that Convair has the inside track to make a deal with Hawker-Siddeley.

Briefairbriefs . . . If all goes well with the U. S. Air Force Mercury program, a man will orbit next year . . . Future space rockets for exploring the moon and planets and putting satellites in orbit

(*Turn to page 82, please*)

Manufacturers' News

Nuclear Radiation Firm Formed

Radionics, Inc., of Norristown, Pa., has been organized to operate in the field of industrial applications of nuclear radiation. Radionics will continue to market industrial gamma radiography equipment and later this year will introduce a complete line of isotope thickness-density gages and gamma-probing equipment. This will be used to detect flaws in heavy materials. Dr. A. J. Stevens is president of the new concern, and Louis P. Farrell is secretary-treasurer.

Cessna Buys Into French Firm

Cessna Aircraft Co. has purchased a 49 per cent interest in the French aircraft firm of Avions Max Holste. Dwane L. Wallace, Cessna president, hailed progress of the Holste company on development of the Super Broussard, a 23-passenger turboprop feeder airliner designed as a low-cost replacement for the DC-3.

Research Center Opens

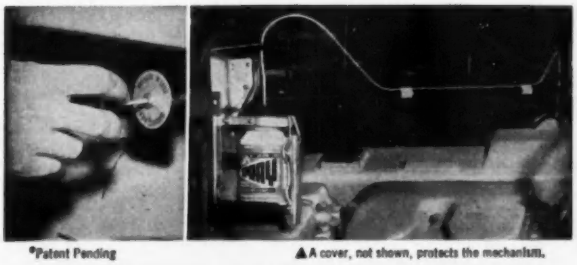
Purolator Products, Inc., has opened new research laboratories at its Rahway, N. J., plant. They will be devoted to pure research and new product development with provisions for pilot production.

PULL THE KNOB AND...

INSTNSTART*

STARTS COLD DIESEL & GASOLINE ENGINES INSTANTLY!

INSTNSTART insures quick starts for cold diesel and gasoline engines all year 'round. (Until an engine reaches normal operating temperature it is a cold engine.) The driver or pilot pulls a knob at his fingertips releasing enough fluid necessary to sustain combustion regardless of weather conditions. INSTNSTART APPLICATORS employ our economical pressurized can of Spray Starting Fluid. This safe, convenient, closed system has been well received in the U. S. and abroad. Quicker starts with INSTNSTART eliminate down-time and prolong engine and electrical system life. It can be installed in minutes with a screwdriver and drill.



*Patent Pending ▲A cover, not shown, protects the mechanism.

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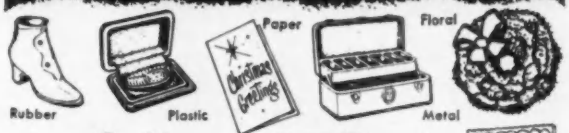

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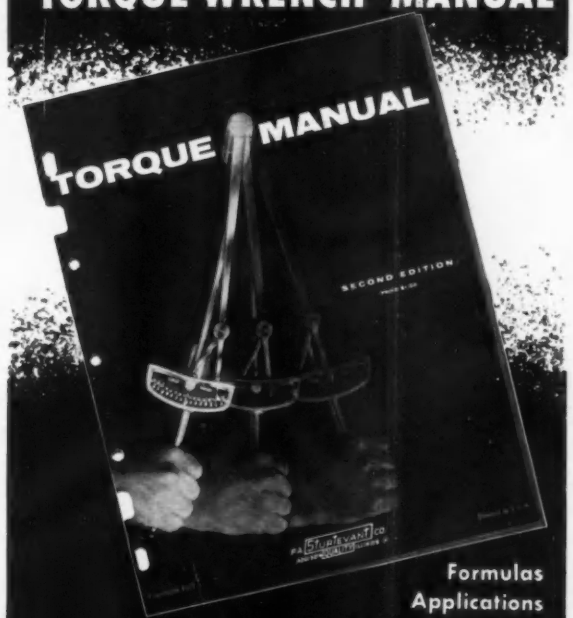

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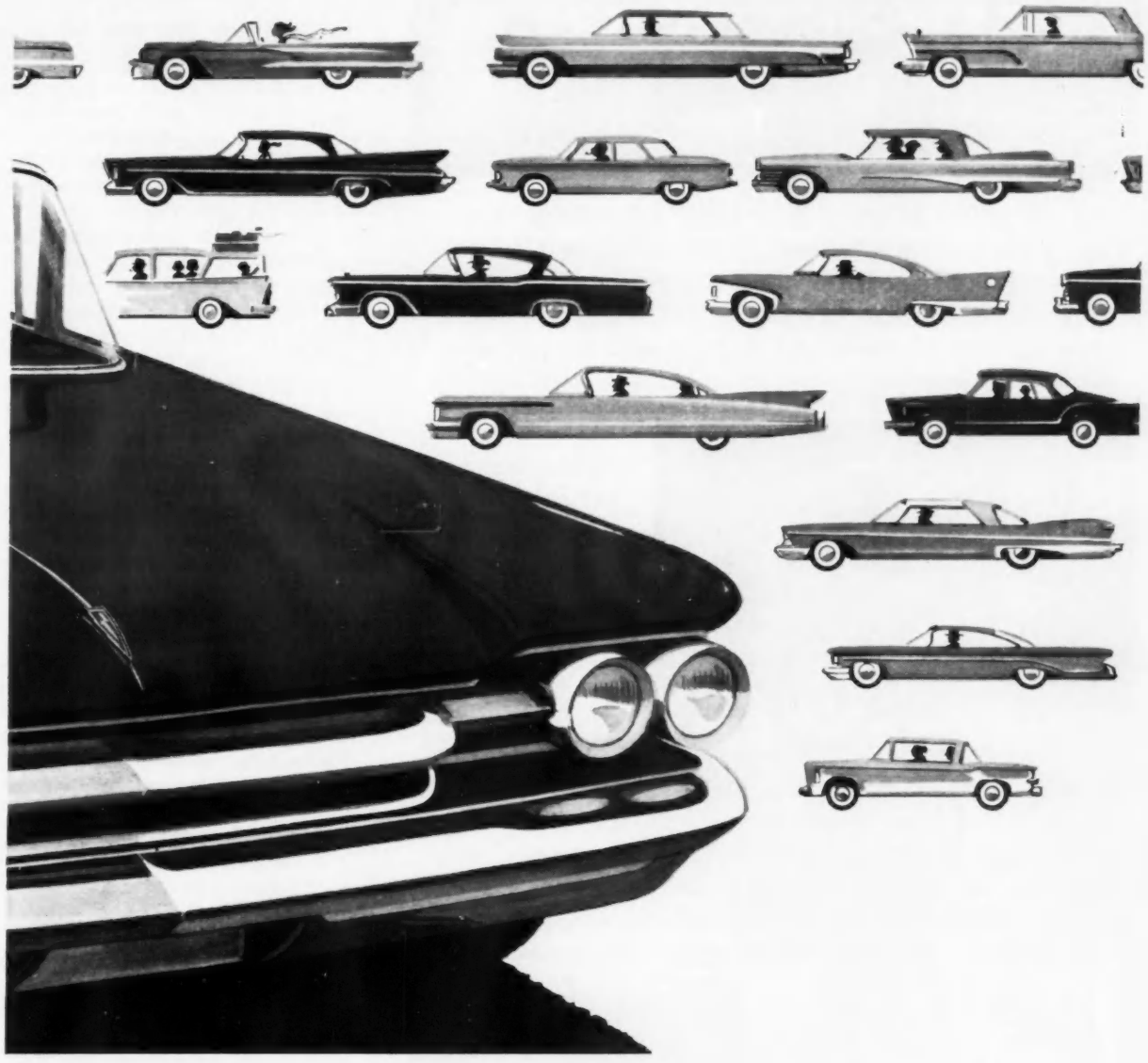

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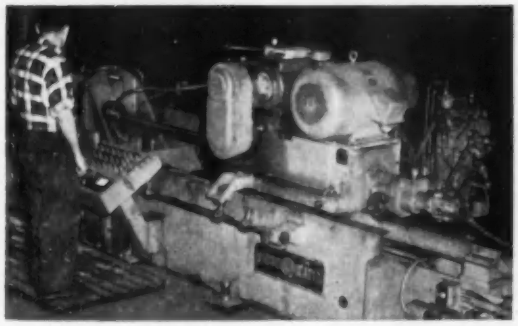
WHY MICROHONING* OF HARDENED LINERS cuts production time two-thirds

One of the largest steel corporations utilizes Microhoning's rapid stock-removal in the processing of oil well slush pump liners. Bore diameters ranging from 4.50″ to 7.75″ and up to 28″ long are lined with a special alloy steel hardened to 64-66 Rockwell "C". Over one cubic inch of stock per minute is removed from bores of these liners to reduce required production time by two-thirds.



This heavy-duty Hydrohoner has a 4-foot hydraulic head stroke, an 8-speed transmission, a special heavy-duty feed mechanism and automatic stonewear compensation.

One heavy-duty horizontal Hydrohoner has eliminated the use of bore grinding (two grinders), and replaced two old vertical honing machines. Requiring only one operator, the Hydrohoner does the complete bore machining operation in one-third the previous time. Also, during the automatic rough-Microhoning cycle, the operator is free for an average of 20 minutes to work on an adjacent machine, where the liner O.D. is machined concentric to the Microhoned bore.

Two Microhoning operations are performed (rough and finish) to provide final bore roundness and straightness within .0005″ and surface finish of 6-8 microinches (rms). An extremely hard surface having geometric accuracy and controlled finish lasts longer, provides better performance – that's why Microhoning is specified for processing these oil well slush pump liners.

Shown are rough-Microhoned and finish-Microhoned bores. Following each Microhoning operation every bore is given a close inspection under the revealing probe of a fluorescent light to insure a flawless surface.

See facing page for details on how Microhoning of pump liner bores secured production time savings.

**Registered U.S. Pat. Off.*

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

SPI Conference

(*Continued from page* 74)

made this need even greater.

The seats of tomorrow must be lighter, thinner, and lend themselves to mass production. The trend to higher labor costs, the need for lighter weight, and the insistance on a smaller package will have to be met. The growing acceptance of the smaller cars is causing a revolution in thinking and building. These compact cars will have to provide an even greater economy, both in initial and operating cost. One means of obtaining this sought-after economy is, as I pointed out, less weight. We cannot stress this point too strongly, particularly when we study the weights of our existing seats. Cellular plastics have a distinct advantage in this area. Being mostly air, it's logical that they can satisfy this important requirement.

Another need in seating, particularly in truck seats, is a cooler seat. The answer could be a porous cellular plastic or possibly perforated much like the pin core now being produced by the latex industry. If this could be done yet maintaining a luxurious feel—ventilation of a seat would become a reality.

In summary, cellular plastics must be perfected to provide lightweight, comfort, and durability at a competitive price. With this accomplishment they will have insured a position of a major supplier to the automobile industry.

The possibilities of this one cellular plastic—polyuethane—are tremendous. There is a market and a need. ■

AIRBRIEFS

(*Continued from page* 78)

should operate more like a hot-rod and less like a skyrocket.

Aerojet-General, on a Navy contract, is taking a revolutionary approach to rocket power plant design. The company is working on a "hybrid"—one which would combine the best features of those using liquid and solid propellants. ■

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

Static Balancing

(*Continued from page* 53)

parts to less than 0.01-oz in.

GMR is currently readying two different types of machines for use in customers' plants. A polished version of the machine in Fig. 2 is being delivered to a GM division's automatic transmission plant for balancing small parts such as the planet carrier. The original version of this machine was an experimental prototype tested by the Detroit Transmission Division some time ago.

The other machine of interest to our readers is the fully automatic brake drum assembly balancer seen in Fig. 3. This machine is being readied for a passenger car plant outside the corporation. It has four stations: centering, unbalance measuring, indexing, welding for balance correction. It will be noted that for convenience in a fully automatic cycle, measuring and indexing have been separated to permit faster operation.

In operation, air-piston rods simultaneously down stroke into hub openings after each cycle. Then the overhead shuttle bar advances all drums by one station. At the measuring and indexing stations, an elevator platform lowers the drums onto the air ball fixture and indexing device respectively. The unbalance location signal generated by the reluctance pickup at the measuring station is fed to the indexing station on the next cycle. The amount signal then is fed to the welding station on the following cycle. ■

Mexican Concern, Budd Sign Contract

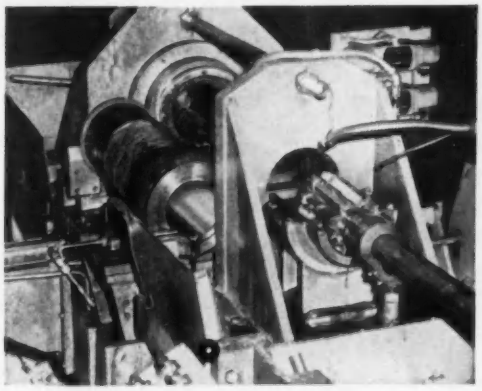
Mexico soon will be making wheels for all types of automotive vehicles after Industria Automotriz de Monterrey, S. A. signed a contract with the Budd Co. for production of wheels for agricultural and industrial vehicles.

Last March, the same firm signed with Goodyear Tire & Rubber Co. to produce wheels for buses and trucks. The Mexican firm will build a plant at San Nicolas de los Garzas, near Monterrey.

HOW MICROHONING OF HARDENED LINERS cuts production time two-thirds

Microhoning eliminates bore grinding (two grinders), replaces two old vertical honing machines with one horizontal Hydrohoner, and performs all bore machining on this one Hydrohoner in one-third of the previous processing time. Here's how these unusual production results are obtained on oil well slush pump liners.

Two Microhoning operations (rough and finish) are performed on the bores of these hardened (64-66 Rockwell "C") liners. Bore diameters range from 4.50″ to 7.75″ and lengths are up to 28″. The rough Microhoning removes approximately .090″ of stock at an average clip of .0045″ per minute and generates a 20 microinch (rms) finish.



Fixturing includes hydraulic end clamping to handle liners from 14" to 28" long. Adjustable hydraulic loader handles varying diameters. Heavy-duty Micromold tooling allows the use of more abrasive for faster stock removal. One tool handles a range of bore diameters.

A new stonefeed assembly, capable of exerting a five-ton thrust, permits this stock-removal performance. When the Microhoning tool enters the bore, the abrasives are instantly expanded against the bore surface. As contact is made, a sensing device de-energizes the rapid feed and a pre-set regular feed rate controls further expansion. At the end of the automatically timed Microhoning cycle, the tool is instantly collapsed and withdraws from the bore.

Changeover from rough to finish Microhoning requires only the replacing of abrasives with finer-grit sticks and resetting of timer to shorter cycle—less than 90 seconds is needed for changeover. Finish Microhoning time is about two minutes, roundness and straightness are held within .0005″ variation throughout the length of bore, and surface finish of 6-8 microinches (rms) is generated.

MMT-PE

Visit Us In Booth 1225—The Machine Tool Exposition

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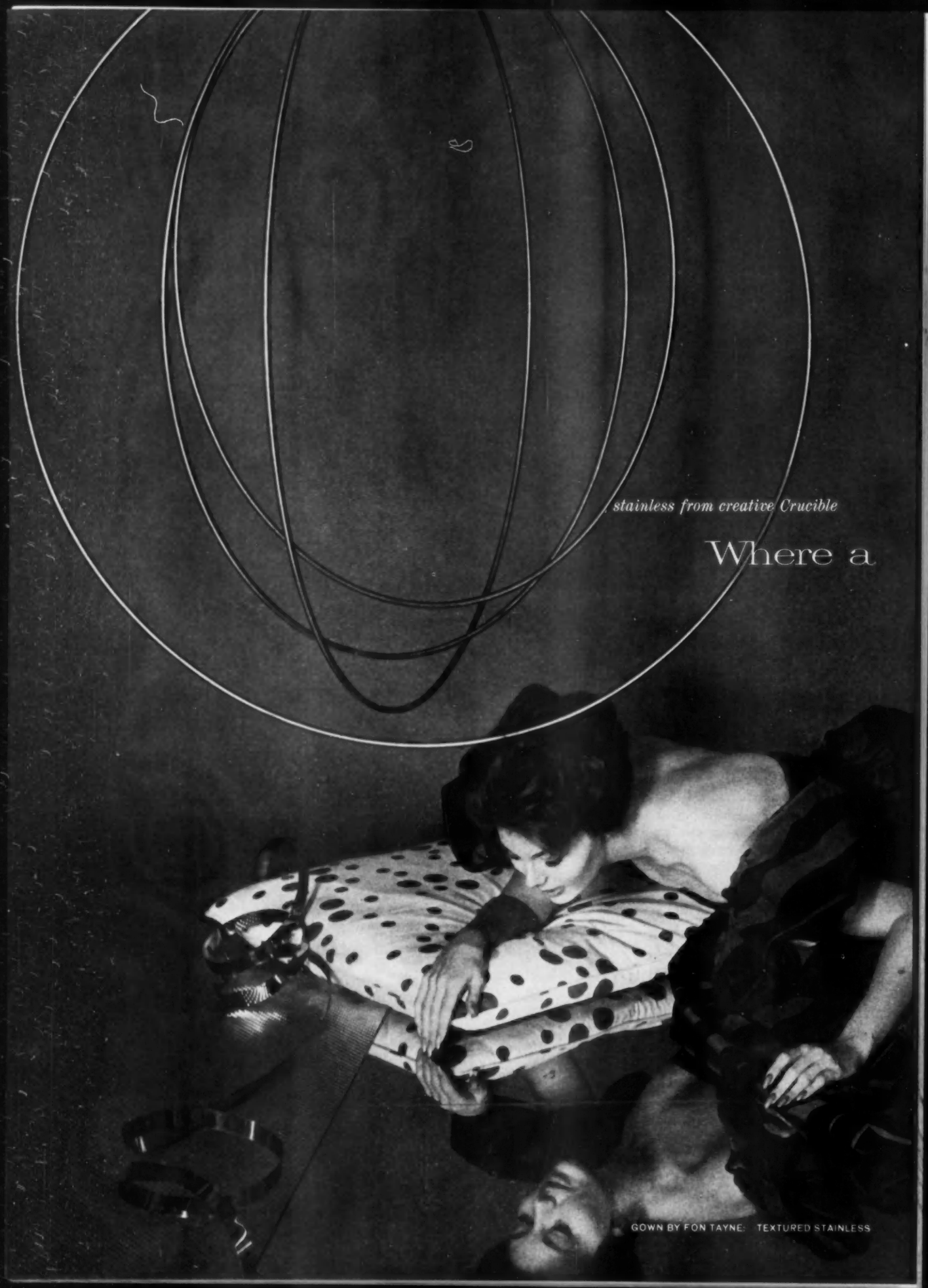
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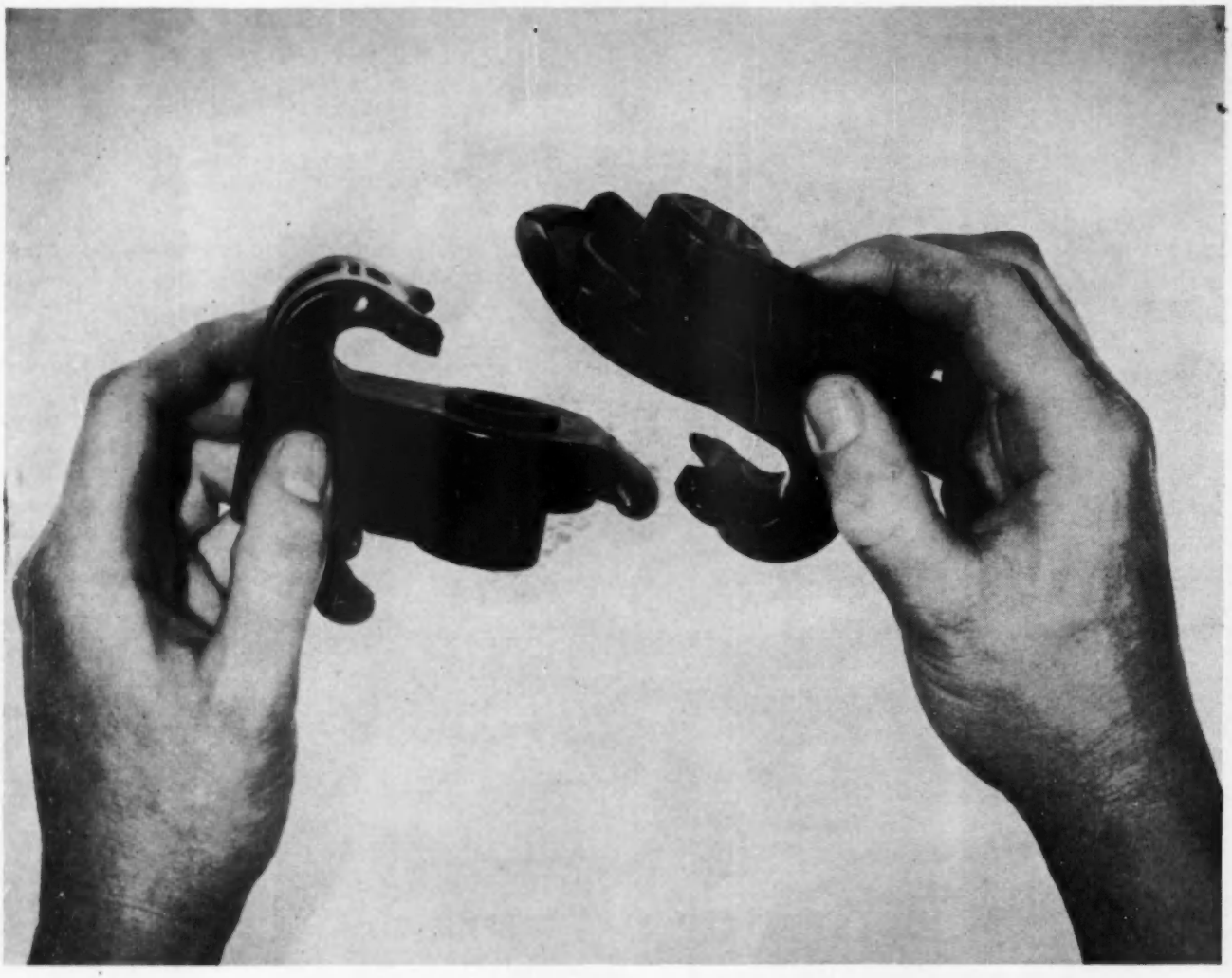

Air-brake couplings of new Du Pont DELRIN®

cost less . . . work better

It took a *new* material to make new "Gladhand" quick-disconnect couplings used on the air-brake systems of truck-trailer equipment. Since the safe operation of the equipment depends on the couplings, the designer made the choice of rugged, durable, dependable Du Pont DELRIN acetal resins. The new design of Midland-Ross Corp., Owosso, Michigan utilized the light weight of DELRIN (50% lighter than aluminum, 75% lighter than iron). It used the corrosion resistance of DELRIN, and its non-sparking characteristics for greater safety. The design also makes use of the resilience and stiffness of DELRIN, which allows the couplings to separate under excessive load before the air hoses break. Because DELRIN can be readily molded in a one-piece ramp-type lock construction, troublesome ball jamming and spring breakage are eliminated.

In short, it took Du Pont DELRIN to make this automotive equipment improvement possible—and to do it at lower cost than previously used metals.

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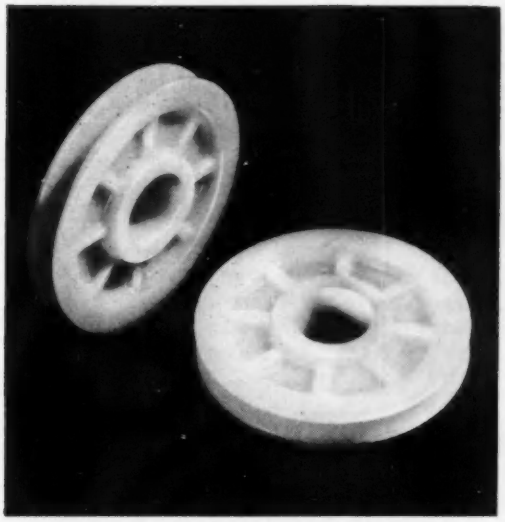
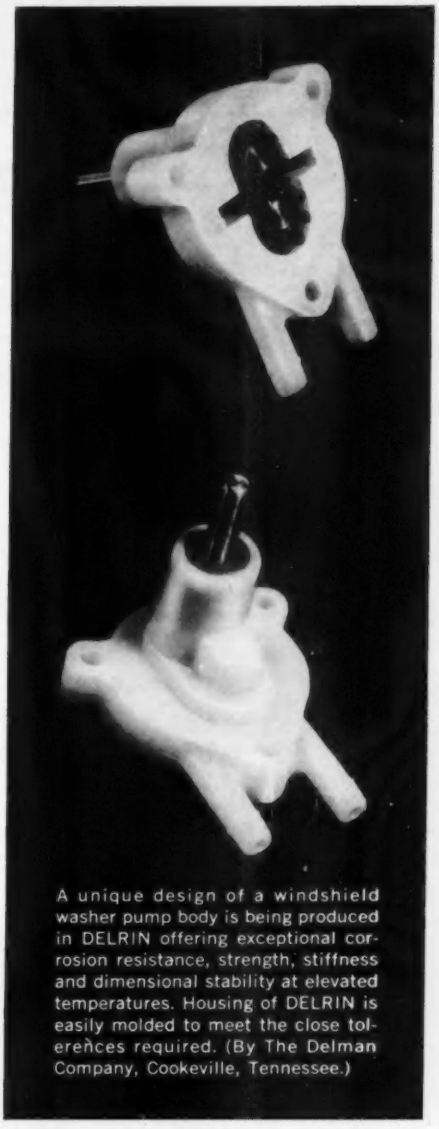


Long-wearing parking-brake cable pulleys of DELRIN are being used by a leading car manufacturer. The full radius groove in DELRIN provides natural mating, maximum contact area with the cable . . . eliminates the cable pinching caused by split-type steel pulleys. Pulleys have been tested under severe long-term conditions of high load and temperatures.



A unique design of a windshield washer pump body is being produced in DELRIN offering exceptional corrosion resistance, strength, stiffness and dimensional stability at elevated temperatures. Housing of DELRIN is easily molded to meet the close tolerences required. (By The Delman Company, Cookeville, Tennessee.)

Resistance to corrosion and high temperature makes Delrin® ideal for many automotive uses

From parking brake cable pulleys to windshield washer pumps, a fast-growing number of automotive products are taking advantage of the unique combination of properties offered by Du Pont DELRIN. The high strength of DELRIN, resistance to corrosion and durability under elevated temperatures assure longer trouble-free operation. And because DELRIN is easily moldable, it permits cost-savings in materials and manufacturing processes.

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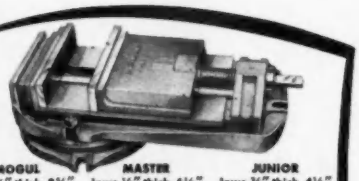

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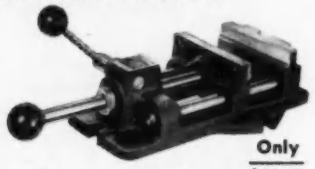

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ASSISTANT EDITOR

Motor Selector 1

This brochure was assembled for quick reference by design engineers so they can pick out the proper unit for a specific application. It contains many illustrations and a chart to cover specifications. *International Resistance Co.*

Spike Power 2

How to improve product quality and lower production costs on resistance welding jobs with the spike electronic control and power system is the subject of a new folder. It explained how metals like aluminum and vinyl-clad sheet steels, that are difficult or impossible to weld, can be handled with this method. *Robotron Corp.*

Mechanical Deburring 3

A new four page, fully illustrated folder details four methods of mechanical deburring. Diagrams and numerous application examples, along with case histories are included in this literature. *Wheelabrator Corp.*

Cylinders 4

A cut-away drawing shows all of the parts in a cylinder and points out the feature of each part. Charts and line drawings cover the specifications of these units. Specific technical information includes bore sizes, rod dimensions, allowable strokes and other data. *The Tomkins-Johnson Co.*

Machining of Teflon 5

"Basics in the machining of Teflon" is the title of an informative booklet that contains R/M suggestions for stress reliving; tools and coolants to use; speeds and rates of feed; rakes, angles and clearances; burrs and chips; surface finishes, and many types of machining operations are also included. *Plastic Products Div., Raybestos-Manhattan, Inc.*

Forklifts of Future 6

Eleven pages describe a line of forklift trucks of today and shows some illustrations of what can be expected in the space age design to come. *The Automatic Transportation Co.*

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ASSISTANT EDITOR

Technical Report 7

Important technical information for production men seeking methods to streamline factory procedures by using pre-finished metals instead of piece plating is available in an 8-page discussion report entitled "Fabricating Qualities of Pre-Finished Metals." The author is F. P. Romanoff, technical director of Apollo Metal Works, pioneers in the manufacture of steel pre-plated with heavy, ductile nickel suitable for drawing into reasonably deep shapes with assurance of effective and uniform plating coverage. *Apollo Metal Works.*

Grooved Sheaves 8

Line drawings and specification data cover a line of variable speed sheaves. Charts are included in this literature to show all pertinent information. *T. B. Wood's Sons Co.*

Tractor Loaders 9

Two pieces of literature are available covering tractor loaders. Illustrations, charts and cutaway views are included to show capacities and specifications. *Allis-Chalmers Mfg. Co.*

Finishing Methods 10

A new technical data sheet covers the abrasive finishing of die cast and rolled zinc. This information sheet gives such data as polishing wheel speeds, type of buff and recommended abrasive compound. Hand and automatic set-ups using both bar and liquid compounds are covered. *The Lea Manufacturing Company.*

Off-The-Road Tires 11

Twenty-eight pages describe and illustrate a complete line of king-size tires that have been designed to operate in the most rugged terrain. Included are line drawings and charts, and the back cover unfolds to show approximate tire size desirable at a given load and pressure. *The Goodyear Tire and Rubber Co.*

Beam Welding Process 12

Electron beam welding operations are discussed in a 12 page brochure. It describes the technique of this welding process and includes illustrations, a schematic drawing and specification data. *The Air Reduction Sales Co.*

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Designers Bulletin 13

A four page bulletin has been especially prepared to provide product designers with up to date information on adhesives and the advantages they offer for joining parts. Principle uses and characteristics of representive formulations are grouped in an easy to read table. *Bostik Dept., BB Chemical Co.*

Plastic Extrusions

This brochure includes several articles dealing with the design and application of plastic extrusions, up-to-date property tables, and short descriptions of materials, and over 700 cross-sectional diagrams of extruded moldings. Since custom extrusions are now used by almost any industry, it was felt that all information which a designer or an engineer interested in specifying or using an extrusion would need should be combined into one booklet. Request on company letterhead. *Anchor Plastic Co., 36-36 36th St., Long Island City 6, N.Y.*

Hex Screws 14

A six page folder describes a line of hex screws. It includes illustrations, line drawings, specification data, and a chart for easy reference. *The Standard Screw Co.*

Plug-In Bus Duct 15

Application data for plug-in bus duct is contained in a new 28-page booklet. The descriptions, drawings, dimensions, specifications, engineering and test data in the publication give specific information needed to lay out, specify and install this type of bus duct. *Westinghouse Electric Co.*

Magnet Wire 16

A 50 page catalog includes full product description with dimensional data and application information. A feature of the catalog is a specially prepared guide designed to give the design engineer a quick method of making preliminary selection of wires according to insulation and other requirements. It covers such types of wire as Formex, Alkenex, polyurethane, cotton, nylon, Teflon, glass fiber, Dacron glass, asbestos, self-bonding, solderable, and others which are combinations of these insulations. *General Electric.*

Engineering Booklet 17

New concepts for applying thin-sectioned large bore ball bearings to equipment designs are presented in a 28-page engineering booklet. Installation drawings show how these bearings save weight, space and cost. Included are 23 drawings of commercial and space age designs. Before and after drawings compare these with other types, to show advantages. *The Kaydon Engineering Corp.*

Engineering Materials 18

The outstanding qualities of four versatile plastic engineering materials are covered in a well illustrated booklet. Charts show the typical properties of these materials. *E. I. duPont de Nemours and Co., Inc.*

Technical Reference 19

A complete line of socket screws are covered in a new, 82-page, technical reference textbook. It contains Product illustrations, performance graphs, mechanical properties, and seating torque charts, and dimension and application data charts. *Standard Pressed Steel Co.*

Adhesive Handbook

A 121-page, pocket size booklet has listings for every major type of industry and business in the country, showing which Permacel products are used for specific applications in each industry. The recommended products include pressure-sensitive tapes, adhesives, sealants, coatings and electrical insulting materials. Please request on company letter head to: *Permacel, New Brunswick, N. J.*

Engineer's News 20

A bulletin, designed for automotive engineers, contains illustrations showing applications of flexible adhesives to automobile hoods to prevent high speed flutter. *Elastomer Chemical Co.*

Electrode Card 21

A handy pocket size card gives application information on all mild steel arc welding electrodes and explains how to identify them according to the American Welding Society — American Society for Testing Metals Classifications. *Hobart Brothers Co.*

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By C. J. Kelly
ASSISTANT EDITOR

"Lift" Batteries 22

Exploded views of batteries show all components that go into the making of these batteries. Also shown is a brief description of each part and what it does. Along with this information are charts, graphs and illustrations to cover the range, capacity and specifications. *Gould-National Batteries, Inc.*

Lapping Techniques 23

An eight-page publication covers lapping techniques, laps, lapping tools and lapping machines. Lapping techniques are detailed, and information is included for lapping on a production basis. Charts for quick reference are included also. *The American Lap Co.*

Magnesium Data 24

The machinability, formability and weldability of magnesium are covered in an illustrated booklet. The various operations are given in three sections. *The Dow Metal Products Co.*

Safety Data 25

Six section in a 75-page catalog contain many illustrations and drawings to coincide with the technical and general information that is included. Handling, storage and precaution are described, to protect life and property. *The Protectoseal Co.*

Vibratory Equipment 26

A new condensed catalog of vibratory materials handling equipment, vibrating parts handling equipment, power rectification equipment, mechanical shaft seals, paper joggers and portable power tools is announced by *Syntron Company.*

Grinding Wheels 27

A new booklet entitled, "Cincinnati Internal Grinding Wheels" describes the features of these wheels. Included in the brochure also, is a table of suggested gradings for internal grinding operations and several helpful rules of thumb to be kept in mind. *Cincinnati Milling Products Div., Cincinnati Milling and Grinding Machines, Inc.*

Clamp Booklet 28

Various types of hose clamps are described in a 16-page booklet. Illustrations and application data for the line are included. *Wittek Mfg. Co.*

Tool Crib Control 29

How one automotive parts manufacturer gained control over four major tool crib problems is told in a case history brochure. The system employed in this case is described and illustrated. *Remington Rand Div., Sperry Rand Corp.*

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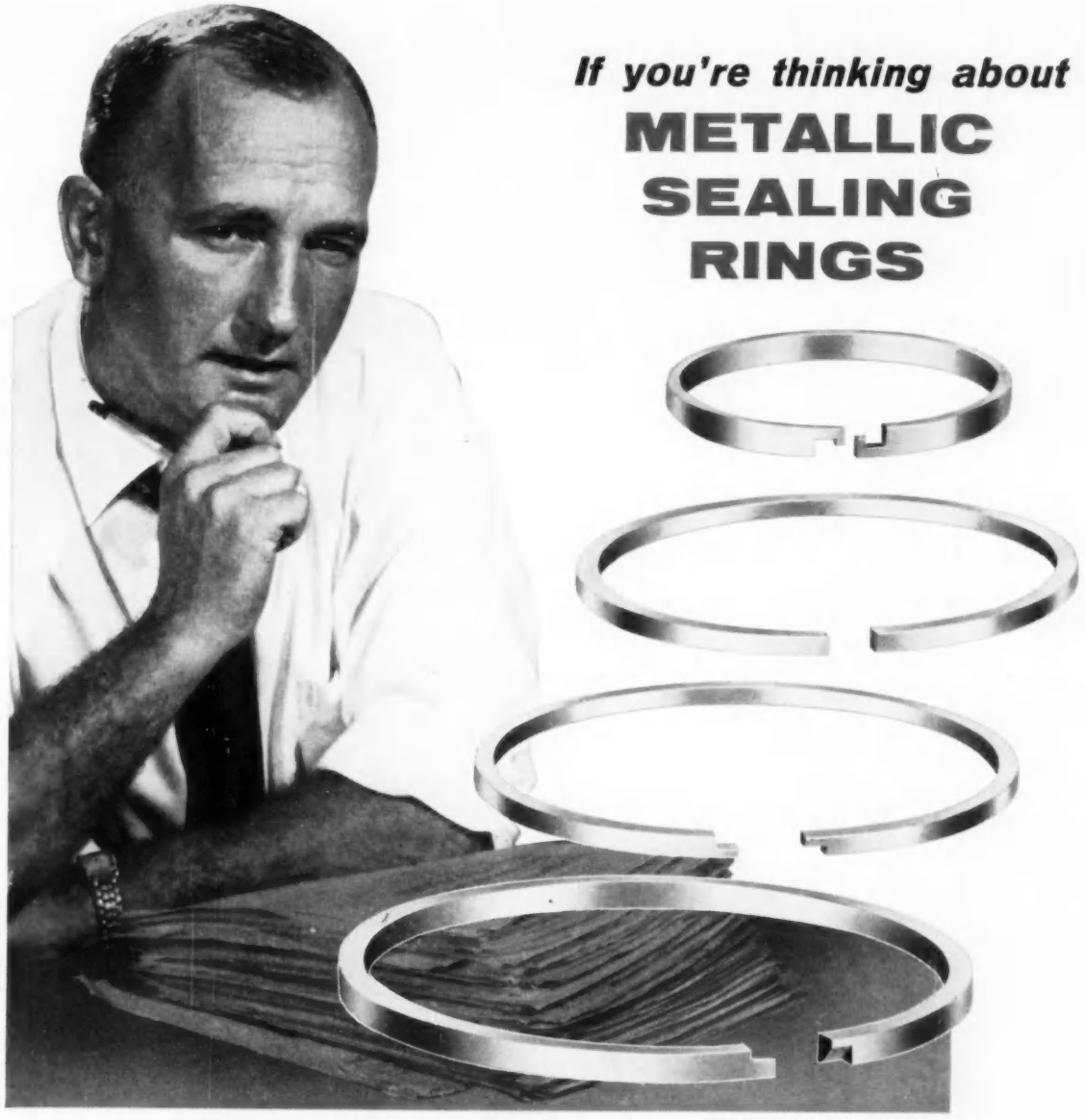

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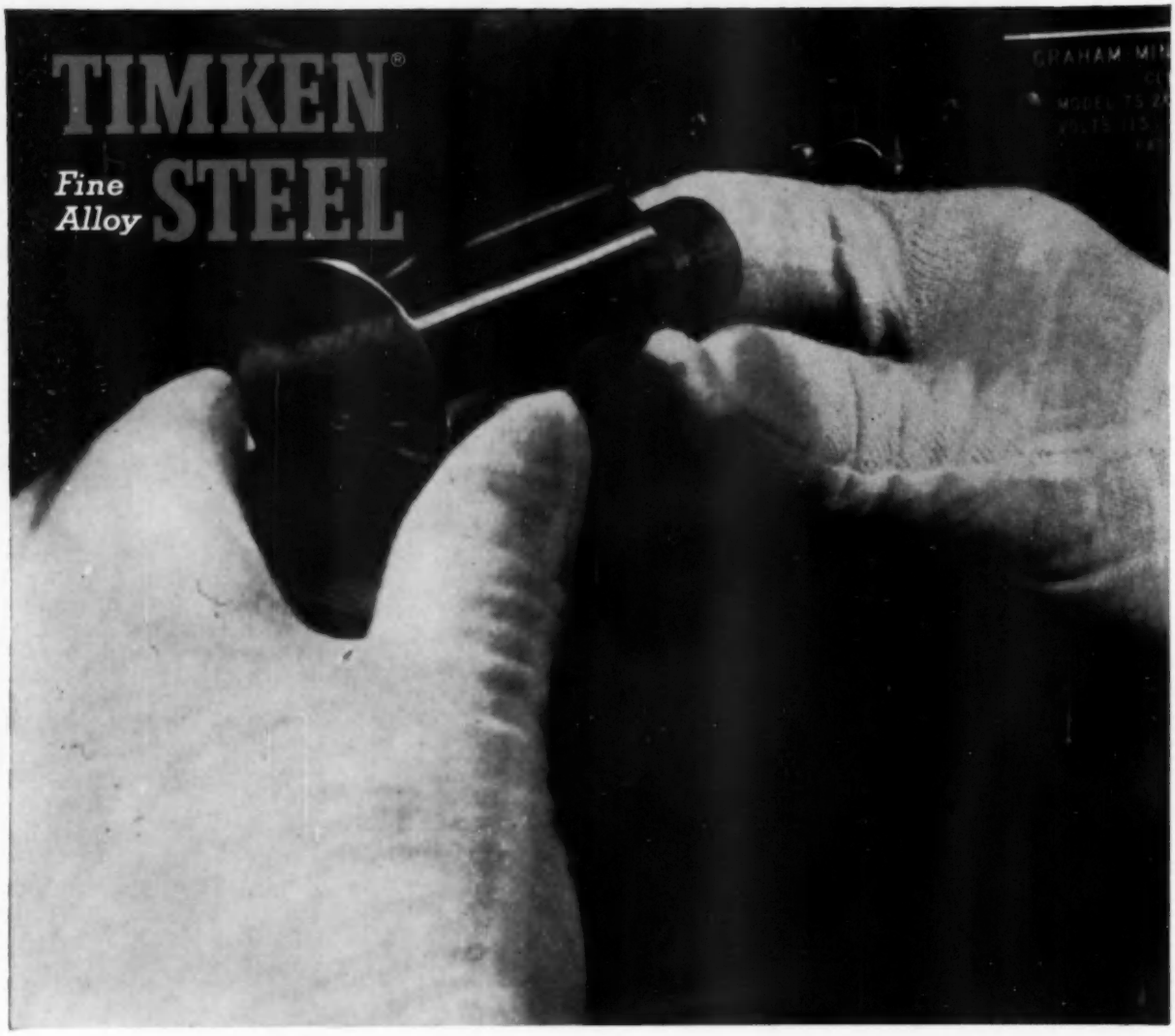

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